Pre-Palæolithic Man

BY

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PREFACE.

THE important subject of pre-historic archæology has of late years come into considerable prominence in this country, and many excellent works, dealing with the antiquity and skeletal and cultural remains of ancient man, have become accessible to the general public. But in these books, the past history of the human race is not generally traced further back than the Early Palæolithic period, when dexterously flaked flint implements of the type known as "Chellean" were in use. It seems clear, however, that these Chellean specimens cannot represent man's first efforts in flint implement making, and that, in consequence, they were preceded by more primitive artefacts which would be found in geological deposits more ancient than those of the Chellean epoch. This little book deals with some of these pre-Chellean implements, and endeavours to show how, in all probability, such specimens were slowly "evolved" into the earliest palæolithic, and later, humanly-fashioned flints. It is becoming more and more evident that a knowledge of the details of flint fracture is of the greatest importance if a real and proper understanding is to be obtained of the flint implements upon which the view of the great antiquity of man is based, as, without such a knowledge, uncertainty must prevail as to whether any given specimen has been flaked by man, or by the unguided forces of nature. Thus I have given in Chapter I. an account of the results of certain experiments in flint fracture, which, while not claiming to be the last word upon this subject, may nevertheless, enable the reader to form a better judgment of the value of the pre-palæolithic implements as witnesses to the remoteness of the period when man first began to shape flints to his needs, than if no such experimental work had been described. Most of the subject matter of this volume has already appeared in the pages of

Science Progress, and the *Proceedings of the Pre-historic Society of East Anglia*, but the time now seems opportune for the new facts regarding the antiquity of the human race to be laid before a larger public such as will be able to have access to this volume.

I would wish to take this opportunity to express my great indebtedness to Sir Ray Lankester, K.C.B., F.R.S., for the invaluable help and guidance he has given me. It is not too much to say that, without his continual support and encouragement the work I have been able to do in prehistoric research would never have been accomplished. I have to acknowledge also with my best thanks the permission of the Editors and Publishers of the above-mentioned journals to re-print certain of my papers and articles which they have published, and for the loan of blocks to illustrate the present volume. In the text figures of flint implements the unflaked cortex of the specimens is indicated by dotted areas. All the views expressed regarding the manner in which the various implements were made have been tested by means of experimental work in flint fracture.

1*st November*, 1919. J. REID MOIR.

CHAPTER I.

FLINT FRACTURE AND FLINT IMPLEMENTS.

THE correct determination of human flaking upon a flint has always been a vexed question with archæologists. The difficulty arose, apparently, in the first place, with the discovery of the Neolithic axes and arrow-heads, as the late Sir John Evans (*Ancient Stone Implements of Great Britain*, 2nd Edition, pp. 56 and 362) mentions that in certain old books these specimens are described respectively as "Thunder-bolts" and "Elf Arrows," clearly proving that a supernatural origin was accorded to them. Though we have no evidence that advanced archæologists were in existence in those somewhat remote times, yet it seems feasible to suppose that even then there were some unable to accept the supernatural theory and who claimed that the flint axes and arrow-heads represented the work of human brains and hands. Be that as it may, the fact remains that no one has for many long years disputed the human origin of these particular flaked flints, which are now universally accepted as affording conclusive evidence of human intention.

But the condition of quiescence so long prevailing in prehistoric circles was rudely shattered by the discoveries of Boucher de Perthes in the valley of the Somme. About the year 1841 it became noised abroad that definite flint implements of man had been found in undisturbed river-gravels of this district, associated with the bones of extinct animals, and that these discoveries afforded evidence of the existence of man at the remote period when such animals existed, and prior to the time when the ancient gravels containing their remains were laid down. Immediately these discoveries were made known to the scientific world, archæologists were plunged into a most violent and sustained controversy regarding the flaked flints discovered. The majority of authorities made haste to repudiate the claim of Boucher de Perthes, and asserted that the flints had been flaked by natural causes, and if not, then they had been made by the workmen at the pits, who had surreptitiously inserted them in the gravel from whence they were removed by the enthusiastic but misled archæologist. (The various and extraordinary arguments put forward against the idea of the human origin of the palæolithic implements discovered by Boucher de Perthes,) are fortunately preserved and can be studied in a book entitled "*The Antiquity of Man*," consisting of papers selected chiefly from the *Transactions of the Victoria Institute* (Elliott Stock, 62, Paternoster Row, E.C.)

There were, however, a few men, who having seen and handled some of Boucher de Perthes' specimens stated they were in agreement with his opinion as to their human origin.

But these opinions made little headway, and for many years the majority of archæologists held to the belief that the flints found in the valley of the Somme had been flaked by some unknown natural forces.

Gradually, however, opinion began to change. Investigations carried out in river-gravels in this country and elsewhere established the fact of the occurrence in these deposits of similar flaked flints to those found by Boucher de Perthes, and at length, after much searching of heart on the part of the archæological world, palæolithic man came into his own. With the general acceptance of the palæoliths, a condition of comparative tranquillity once more descended upon the question of man's antiquity ; and though there were some bold spirits who held that an elaborately flaked palæolithic implement could not, in the nature of things, represent man's first effort in the fashioning of flint, and that, in consequence, his earlier efforts would probably be found in deposits more ancient than the palæolithic river-gravels, yet these were but "voices crying in the wilderness" and little heed was paid to them.

The mutterings of the coming storm, which was to sweep away the orthodox limits set to the antiquity of the human race, were first heard from Ightham in Kent, where Mr. Benjamin Harrison, having found palæolithic implements in the oldest river gravels of his district began to investigate still more ancient deposits situated on the high plateau of Kent. These investigations resulted in the discovery of a series of rough flints exhibiting flaking along one or other of their edges. This discovery and the announcement that several archæologists, including the late Sir Joseph Prestwich, regarded these specimens as affording evidence of the former existence of a race of beings much more ancient than the makers of the palæoliths, initiated another period of unrest, and for the third time the archæological world was grievously disturbed, and the usual division of forces took place. Those who supported Mr. Harrison asserted that the flaked flints he had discovered were undoubtedly the work of man, and represented the type of implement which they would expect to find in such an ancient deposit, while his opponents contended that the flaking of the flints was undoubtedly due to natural pressure or percussion and therefore not indicative of human handiwork. Since the publication of Mr. Harrison's discoveries, a number of pre-palæolithic implements which seem to link up the primitive Kentian implements with the later palæoliths, have been found in various Pliocene and early Pleistocene deposits in East Anglia, and these specimens, though accepted by an ever-widening circle of prehistorians, have in their turn been regarded by certain investigators as representing the work of nature. It will thus be seen that the science of prehistory has advanced only by slow and somewhat painful steps, and it may be of interest to enquire into the causes of this tardy progress.

The prolonged and heated controversies which have inevitably followed any new discoveries of flaked flints tending to extend the antiquity of the human race, indicate clearly that the acceptance or non-acceptance of these specimens has not been actuated by any well established knowledge of the differences exhibited by flints flaked by man or by the unguided forces of nature.

If such knowledge had existed the controversies which raged round the neoliths and palæoliths, and are now being conducted in regard to the pre-palæoliths, would either have not occurred at all, or, if commenced, would have been of a less prolonged and heated character. But in the absence of definite scientific data, other and less satisfactory means for arriving at a decision had to be employed. A prehistorian expressed himself to be in favour of accepting or not accepting any given flaked flints, simply by reason of his preconceived views and personal prejudices, and many present day investigators are, it is feared, still swayed by such unscientific influences.

In the long run what is known as "common sense" prevailed in regard to the neoliths and palæoliths, and there seems but little doubt that the pre-palæoliths will also be finally accepted on the same grounds; but the processes of common sense are slow and not necessarily scientifically adequate, and other and more satisfactory means of determining whether a flint has been flaked by man or by nature ought to be available. It appears that the only method likely to lead to definite and satisfactory results would be to conduct a series of experiments in which flints would be subjected to the effects of fortuitous percussion, and pressure, and to critically compare the fractures so produced with others caused by a hammer-stone held in the hand, and used in the manner in which ancient man probably used it. It might be urged that it is impossible to simulate experimentally, the effect of natural forces upon flints, but on the other hand it seems reasonable to suppose that fortuitous blows and pressure do not differ fundamentally, whether brought into action by nature or in experiments conducted by a human being. The "mightiness" of natural forces cannot certainly be imitated experimentally, but it has been ascertained that flints will only stand, without disintegration, a certain amount (by no means very large and easily equalled in experiments) of pressure and force of blows, and that, in consequence, when the natural forces in operation are too mighty, the flint must be shattered and reduced to fragments. The author concludes, therefore, that the experiments he has conducted in the flaking of flint are of value in this discussion, and though further researches will no doubt be necessary before the problems connected with human and natural flaking are finally and completely solved, yet he feels that the results already obtained may help to dispel some of the doubts and difficulties, and thus place the question of the antiquity of man upon a firmer and more scientific foundation. It is proposed in the first place to tabulate and describe some of the details of flint fracture, to which reference will be made in the description of the experiments carried out. The nature of the experiments in which flints were subjected to fortuitous percussion, and the conclusions arising therefrom, will then be described, and finally in a like manner, the experiments in which fortuitous pressure was employed.*

*A complete series of the flints fractured experimentally can be seen and examined in the Department of Ethnography at the British Museum. (Bloomsbury).

DETAILS OF FLINT FRACTURE.

Striking-Platforms.—When an ordinary nodule of flint is selected with a view to produce an implement from it by flaking, it is necessary, owing to the difficulty of removing flakes from a rounded surface, to break off a portion of the nodule, so that a flat surface is produced, upon which flake-removing blows can be struck with precision. The flakes which are removed will exhibit, in the immediate vicinity of the point where the blows fell which detached them (known as "the point of impact") a portion of this flat surface, and this is termed the "Striking-platform."

The Cone of Percussion.—When a certain type of blow is delivered in the centre of a flat surface of sound flint, and the portions of this surface surrounding the point of impact tapped gently with a hammer, these portions will generally fall away, revealing a more or less perfect cone of flint. This is known as the "cone of percussion," and is due to an inherent property in the flint itself to fracture in this manner. This peculiar method of fracture is also found to be present in some other substances, such as glass, obsidian, etc.

Positive and Negative Cones of Percussion.—When a flake exhibits just below the point of impact a conical protuberance, and the block from which it was struck a corresponding hollow or depression, the former is known as the "positive" and the latter as the "negative" cone of percussion. The detached flake may sometimes exhibit the negative cone and the parent block the positive, but that does not affect the validity of the description given above.

Éraillures.—If a number of flakes removed by blows are examined it will be seen that many of them exhibit on their bulbar surfaces (that is the surfaces upon which the positive cone of percussion is visible), a scar, where a small and isolated flake has become detached. This small flake is apparently removed simultaneously with the detachment of the larger flake, but the exact reason for its removal does not appear up to the present to have been satisfactorily explained. This éraillure or "mark" is sometimes seen upon flakes removed by pressure. (Fig. 1, Plate 1).

Ripple Marks or Conchoidal Rippling.—Ripple marks, which are often seen upon the flake-scars of implements of human manufacture, and also upon those of flints flaked by fortuitous means (they appear to be more prominent and frequent upon the latter), are due to the tendency of flint under certain conditions to fracture in a conchoidal or shell-like manner. It seems that these conchoidal ripplings are somewhat analogous to the ripples produced upon a surface of water when some heavy object is thrown on to it. The water is "jarred" by the impact and ripples produced, and it may be that certain blows jar the flint and so produce ripplings on the fractured surface. Conchoidal ripplings are sometimes formed when a flint is fractured by pressure.

Fissures.—If a series of flakes or flake-scars is examined it will be noticed that their surfaces exhibit a series of fissures of varying length and width, which radiate from the point of impact. Some of these markings are easily visible to the naked eye, while others require a strong lens to discern them. It seems that their presence can be accounted for by supposing that when the flake is removed the flint is in a sense torn, and that these markings represent the tears produced by the cleaving effect of the blow. Fissures are sometimes produced upon a flint which has been fractured by pressure.

Truncated Flake-scars.—When the manufacture of a flint implement is commenced, large flakes are removed from the nodule of flint, the resulting scars of which in the further process of flaking get reduced in size or truncated. Thus it is possible to observe the remains of flake-scars which have been reduced in size, on various portions of the surfaces of many implements. These scars are termed "truncated flake-scars."

Opposing Cones of Percussion.—Under certain conditions a flake-scar produced by pressure may exhibit a well-marked cone of percussion at each end. This is due to the flint having been squeezed between two hard objects and the cones represent the points at which, respectively, pressure and resistance acted. These cones are known as "opposing cones of percussion."

EXPERIMENTS WITH FLINTS SUBJECTED TO FORTUITOUS PERCUSSION.

Seven or eight flint nodules of various shapes were placed in a sack and violently shaken about for some little time, and in such a manner that the flints were in almost continual collision. It was found that only the stones of a certain shape and conforming more or less to a wedge in form (the thin edge of the wedge being usually attacked) were flaked in this process. The rounded flints in the sack were not flaked, but escaped with contusion of their surfaces only. A careful examination of the flaking produced by these fortuitous means, and a comparison of it with that due to human blows, appears to show that there is a fundamental difference between the two methods of fracture. This difference is, primarily, the angles at which the flakes have been removed. The method adopted to ascertain the direction in which any given flake has been removed from a flint is as follows. A line is drawn down the centre of the flake-scar and at right-angles to the ripple-marks (these in many cases require locating with a good lens). Then two other lines are drawn, one on each side of the central line, and also at right angles to the ripple-marks as they curve upwards. The three lines are then continued to their point of junction, which point indicates the area upon which fell the blow that detached the flake.* (Fig. 2, Plate 1).

The correctness of this method can be checked by observing the direction of the small fissures or "splits," which gives an additional indication of the angle at which the flake was removed. (Fig. 3, Plate 1). Careful outline drawings were then made of the flints flaked in the sack experiment, and also of those shaped by human blows.

Each flake-scar was accurately drawn and the direction of the blows responsible for the flaking indicated by arrows.

When this was done it was seen that the flints from the sack had had their flakes removed at divergent angles to the edge of the stone (Fig. 4, Plate 1), while those fractured by human blows, had had them removed at a constant angle (Fig. 5, Plate 1). It does not appear possible that fortuitous haphazard blows would remove flakes at a constant angle to the edge of any flint, neither does it seem reasonable to suppose that any human flaker would go to the trouble of making a sharp edge by means of divergent blows, as the result would be much less satisfactory than one produced by the normal method. It appears then that we have here one good

* This method is adopted only when dealing with a truncated flake, when the actual bulbar cavity is present such a method is not needed.

and simple means of distinguishing between the work of man and of nature.*

A further examination of the specimens fractured in the sack experiment demonstrated that the flakes which had been removed differed in appearance from those due to human blows. This difference being :—

(*a*) The "squatness" of the fortuitous flakes as compared with those removed by human agency. (Fig. 6, Plate 1).

(*b*) The fact that the former had cut deeper into the flint, causing a step or ledge to appear at the point of their final separation from the parent block (Fig. 6, Plate 1) and

(*c*) The occurrence of numerous prominent ripple-marks upon nearly all of the flake-scars produced by fortuitous blows, as compared with their comparative scarcity upon the "human" flakes. (Fig. 6, Plate 1).

The explanation of these differences may be explained as follows :—

In intentional human-flaking, a flat striking platform is produced, and blows are delivered on one or other side of this platform, and in such manner that the flakes removed are generally the reverse of squat, being of greater length than width, and thinnest at the point of their final separation from the parent block. (Fig. 7, Plate 1).

Such flakes are also generally free from prominent ripple-marks, due, in the author's opinion, to the fact, that the blows which detached them were delivered almost vertically to the striking platform.

In flaking produced by fortuitous percussion, the great majority of the blows fall apparently not upon the side of the edge of the flint, but almost directly upon the edge itself, and it is known that blows so delivered remove flakes squat in form and productive of a step or ledge at the point of their final separation from the parent block.

It has been ascertained, that consistently to remove flakes exhibiting prominent ripple marks upon their surfaces, it is necessary to strike the flint an oblique blow. As has already been mentioned,

* The author has examined and made flaking-diagrams of a large number of flints found upon sea-beaches, and the flakes removed from these specimens by fortuitous battering are at markedly divergent angles.

CHAPTER I. PLATE 1

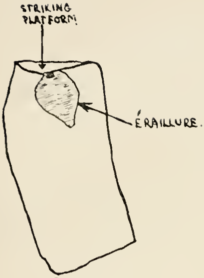


FIG. 1.

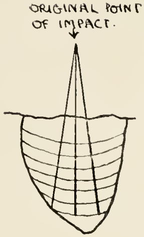


FIG. 2.

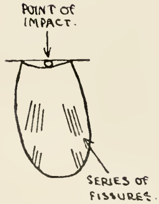
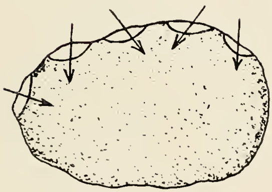


FIG. 3.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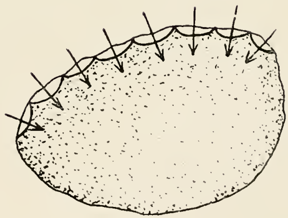
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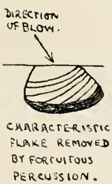

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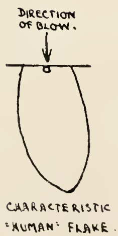


FIG 7.

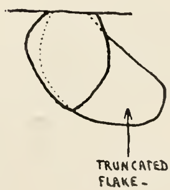


FIG. 8.

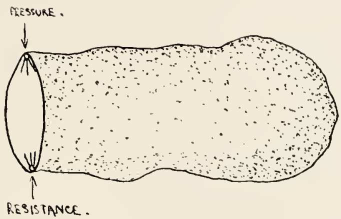


FIG 9.

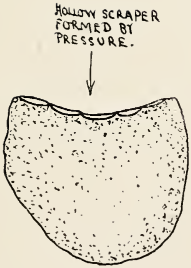


FIG. 10.

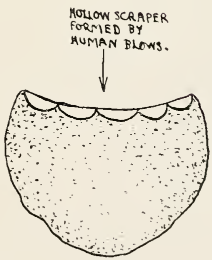


FIG. 11.

a blow delivered vertically to a flint surface will remove a flake almost devoid of ripple marks, and it is supposed that such a blow has less jarring effect upon the flint, and consequently produces less rippling of the fractured surface, than one delivered in an oblique direction. The explanation of the frequent occurrence of prominent ripple marks upon fortuitous flakes, and their comparative scarcity upon those produced by human blows, may be as follows. It may be assumed that there are 180 angles at which a flake may be removed from any given length of edge, but it is only more or less vertical blows, delivered at a few of the higher angles, that will remove flakes exhibiting insignificant ripple-marks. Thus in fortuitous, haphazard blows the chances are that the greater number of blows will be delivered at the lower angles, which are oblique to the edge of the flint, and as has been shewn, such blows remove flakes exhibiting prominent ripple marks upon their surfaces. It seems then, that in the shape of the flakes, their character at the point of final separation from the parent block, and the presence or absence of prominent ripple marks upon their surfaces afford further criteria for determining whether any particular series of flints has been flaked by man or by nature.*

It was noticed that the edges of all the wedge-shaped stones fractured in the sack experiment, showed a tendency to assume a sinuous outline due to blows having fallen upon either side of these edges.

The majority of the stones exhibited this sinuosity in an incomplete manner, but one specimen showed a markedly sinuous edge 4½-in. in length. A critical examination (based upon the tests already described in this chapter) of the flaking to be seen upon this flint, demonstrated clearly its natural origin, but another characteristic of the flaking was detected which seems to still further differentiate it from the work of man. It was found that the edge of this flint though only 4½ inches in length exhibited seventeen truncated flake-scars. (Fig. 8, Plate 1).

On the other hand an examination of various neolithic and palæolithic implements with sinuous edges, demonstrated that the average number of truncated flake-scars on an edge 7 inches long is only six.

* In arriving at a decision it is necessary to examine not less than twenty or thirty specimens. A lesser quantity examined might lead to erroneous conclusions.

The explanation of the greater number of truncated flake-scars upon an edge produced by fortuitous blows, as compared with one formed by human agency, may be, that in the former case the rain of blows is almost continuous and the flint is continually being reflaked and truncated flake-scars formed. It is, however, somewhat difficult to imagine any human flaker being so inept at his work as to be compelled to form seventeen truncated flake-scars in the production of an edge $4\frac{1}{2}$-in. in length.

The author considers therefore that the proportion of truncated flake-scars upon a flint may furnish a further criterion for the determination of human as against natural flaking.* Various other experiments in fortuitous percussion, such as the hurling of a flint upon others, lying on the ground, were carried out, and the results found to be similar to those obtained in the sack experiment.

EXPERIMENTS WITH FLINTS SUBJECTED TO THE EFFECTS OF FORTUITOUS PRESSURE.

Experiments were conducted with an adapted letter-press, and a differential screw-press, with which considerable pressure was obtained.

It was found that when a suitably shaped stone was placed upon the floor of the press, and another smaller stone placed on the top of it and near its edge, a flake could be removed from the lowermost flint by forcing the ram of the press down upon the uppermost. The flake-scars so produced exhibited "opposing cones of percussion, "(Fig. 9, Plate 2) due to the pressure upon the upper portion of the flint being equalled by the resistance afforded by the floor of the press. The presence of a cone of percussion at each end of these flake-scars differentiates them from those detached by human blows, on which only one bulb of percussion is visible. When a duster was placed on the floor of the press, so that the flint rested upon a soft base,it was found that a flake could be removed but only with the exertion of considerably more pressure than was needed in the former case. It was noticed also that such flakes, exhibited only one cone of percussion, at the point where the small upper stone impinged upon the flint, as is the case of flakes removed by human blows. The majority of these

* In the re-sharpening of many neolithic scrapers and Mousterian (palæolithic *racloirs*) a number of small truncated flake-scars were produced, but these are not of the same order, or comparable with the truncated flakes described above.

cones of percussion however are flat and appear to be only partly developed, and in this respect they differ from the majority of cones of percussion produced by human blows. Pressure flakes, too, seldom exhibit well marked éraillures, while the fissures and ripple marks, if present, are of a different order from those present upon humanly-struck flints.

These differences are readily observable when a representative series of each kind of flake is put out for examination, and appear to be due to the different nature of the two fracturing forces. The human flaker is able to guide the line of fracture, within limits, in any direction he pleases, while in the case of pressure the flint is squeezed until it can stand the strain no longer, and finally fractures along the line of least resistance. Future investigations may perhaps modify this explanation, but at present the author regards it as affording a likely reason for the difference, which undoubtedly exists, between flakes removed by pressure and those detached by human blows. Experiments were also conducted in which a hard resistant stone was placed upon the floor of the press, and another with a sharp edge placed against it in such manner, that the descending ram would cause this sharp edge to move under pressure over the surface of the other specimen. By this means a flaked hollow was produced in the sharp edge of the uppermost stone.* Several of these hollows were produced and compared with others formed by human blows. This comparison demonstrated that there was a marked difference in the appearance of the two series of hollows. It appears that when the sharp-edged flint is being moved under pressure over the surface of the underlying stone very thin flakes or scalings are detached. This is due apparently to the fact that the pressure is able only to attack a very narrow area of the edge of the moving stone and in consequence only very thin flakes are removed.

In flaking produced by human blows, it is impossible to strike so near to the edge of the flint as to remove flakes as thin as those detached by pressure and a hollow flaked by the former means always appears, and is more uneven and less finished than one produced by pressure.

* A similar result can be obtained by placing a sharp-edged flint upon another stone, lying on the ground, and turning one's heel round on them, under pressure.

The pressure hollows appear "smoother" than those of the other kind, because, the flakes removed being thinner, the ridges intervening between them are less prominent. (Fig. 10. Plate 2).

In the case of the human blows, which cut more deeply into the flint and remove thicker flakes, these ridges are correspondingly more marked.* (Fig. 11. Plate 2).

The foregoing experiments in fortuitous percussion and pressure have been repeated many times and the results found to be uniform in each case. It is hoped that prehistorians will be able in future to give more attention to the question of the natural and artificial fracture of flint, as affording the only means of arriving at satisfactory conclusions regarding the "humanity" or otherwise of the specimens which are the subject of their study. Mere speculations as to the capabilities of man or nature to flake flints in the remote past, are, in the author's opinion, of little value.

* The author has lately examined the Eocene flint bed resting upon the Chalk at Bramford, near Ipswich, where many specimens have been fractured by natural pressure in the bed in which they now lie. This examination has shewn that the fractured Eocene flints reproduce in a marked degree the characteristics of those fractured by pressure in the experiments described. See *Proc. Prehis. Soc. of E. Anglia,* Vol. 1, Part IV., pp. 397-404.

Chapter II.

THE OLDEST FLINT IMPLEMENTS.

In the preceding chapter the past and present position of prehistoric research was reviewed, and a description given of a number of experiments in the fracture of flint, which were carried out with the object of providing prehistorians with some satisfactory data upon which to base their acceptance or rejection of any series of flaked flints as being humanly fashioned. It is now proposed to apply the criteria furnished by the above-mentioned experiments to a series of very primitive and ancient flaked flints first discovered by Mr. Benjamin Harrison in the high plateau of Kent, which have been the cause of much disagreement and disputation amongst archæologists. Without troubling the reader with the somewhat complex geological facts which demonstrate the great antiquity of these primitive flaked flints, it may be stated that the deposits in which they mostly occur, pre-date, by a considerable period, those in which the earliest implements of river-drift, or "palæolithic" man, are found, and in consequence of which the chipped stones recovered from these very ancient deposits have been rendered suspect by those who hold conservative views upon the question of man's antiquity. But it must be pointed out that those who believe that these very ancient flaked flints are humanly-fashioned, may with equal justice, be said to hold extreme views in favour of the high antiquity of man, and unless either school can bring forward definite, scientific facts in support of their respective opinions, those opinions must be regarded as being of very little value. The author does not propose therefore to enumerate the various reasons which have been advanced in the past for the rejection or acceptance of these particular specimens. He proposes to confine his remarks solely to the characteristics of the flake-scars exhibited by them, and by comparing them with those produced on other stones, on the one hand by means of fortuitous percussion and pressure, and on the other by blows delivered with a hammer-stone used in the ordinary "human" manner, to decide whether these very primitive flints have been flaked by man, or by the unguided forces of nature. But it may be as well, before proceeding to describe the specimens selected for illustration, to give the reader some idea of the general appearance of these primitive edge-flaked flints.* They are usually of a more or less tabular form, the whole of one side of which very often exhibits the original crust or cortex of the flint, while the whole of the other is represented by the hard interior owing to the specimen having been split by some disruptive force, which frequently, but not always, can with some confidence be described as being of thermal origin. The edges of these tabular flints have then been trimmed by somewhat steep flaking so that the specimens assume a pointed form (Figs. 1, 2, 3. Plate 3), or are provided with a more or less straight cutting-edge (Figs. 4, 5, 6, Plate 3), and it has been suggested by those who regard these specimens as being humanly fashioned that such forms might have been used by a primitive race of people for boring and scraping purposes.

The colour of the flaked and broken surfaces of the specimens is generally reddish brown, some being of a darker shade than others. They very often show signs of having been subjected to rolling by water, which has had the effect of rounding the sharp edges and angles of the flints, and of imprinting upon their surfaces incipient cones of percussion due to the impact of other stones. Very frequently, too, the specimens exhibit striæ on one or other of their flat surfaces, showing that at some period of their history they have been subjected to a slight amount of pressure. There can be no doubt that it is of importance to make a really dispassionate study of these primitive edge-flaked stones, as their antiquity is undoubted, and if of human origin, they represent man's first efforts to shape flints to his needs.

The author has had various opportunities during the past few years of critically examining a number of these ancient flints, and has selected six (together with three others) from his own collection for illustration in this chapter.

* These specimens have been known to archæologists as "Eoliths" (*eos* – dawn, and *lithos* – stone), but as some observers have used this term to describe any piece of roughly broken flint it is necessary to adopt a more precise nomenclature.

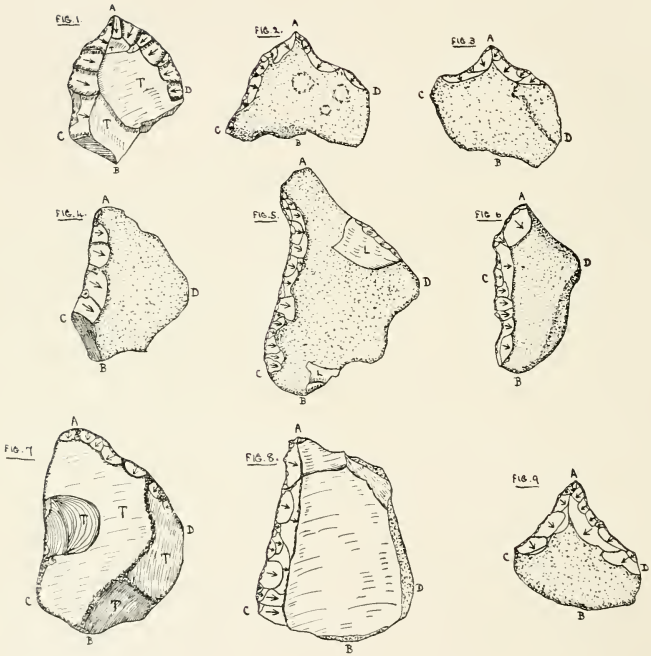


FIG. 1.
FIG. 2.
FIG. 3
FIG. 4.
FIG. 5.
FIG. 6
FIG. 7
FIG. 8.
FIG. 9

In the delineation of these specimens a severely diagrammatic style has been adopted, but each flake-scar is faithfully outlined, and the arrows which indicate the direction in which the force acted which removed the flakes, have been put in with very great care.

Description of the Specimens. (Plate 3).

Fig. 1. Found in a gravel pit in the occupation of Messrs. A. Bolton and Co., Ltd., Henley Road, Ipswich. The gravel occurs at a height of about 120 O.D. and forms one of the plateau series of deposits. It is generally supposed to be intermediate in age between the early glacial Contorted Drift of Cromer and the glacially deposited Chalky Boulder Clay. The specimen, and others of the same order from the gravel, have evidently by their condition, been derived from some still more ancient deposit which at some remote period was broken up and re-deposited.

The flaked areas of the flint are light chestnut brown in colour, and the side opposite to that figured is formed of unflaked cortex which is extensively coated with a deposit of (?) manganese. The major fractures (marked T in the illustration) are almost certainly of thermal origin, while the edge-flaking which has given to the stone the well-marked pointed form, is considered, for reasons which will be given later, to be the result of blows. The specimen which measures in greatest length (A – B) $2\frac{1}{4}$-in., greatest width (C – D) $2\frac{1}{8}$-in., greatest thickness $\frac{5}{8}$ of an inch, exhibits neither scratches nor incipient cones of percussion upon its flaked surfaces. The edges and angles of the flint are somewhat smoothed, possibly by the action of running water.

Fig. 2. Found in the high level plateau gravel of Kent. The exact geological age of this deposit, though undoubtedly extremely ancient, is still in debate, and as it does not contain any fossiliferous remains, it is possible that it may never be satisfactorily dated. The flaked areas of the specimen range in colour from yellowish white to yellowish brown. The upper surface is formed almost entirely of unflaked cortex which is of a dark brown colour. The under surface, which appears to be attributable to thermal breakage, exhibits the hard interior of the flint, and is extensively scored with small striæ which follow very erratic and non-parallel courses.

The edge-flaking which has given to the stone the well marked pointed form is considered to be the result of blows. The specimen which measures in greatest length (A – B) $1\frac{3}{4}$-in., greatest width (C – D) $2\frac{7}{16}$-in., greatest thickness $\frac{3}{4}$-in., exhibits no incipient cones of percussion upon its flaked surfaces, nor does it show any signs of having been subjected to the smoothing action of running water.

Fig. 3. Provenance the same as specimen represented in Fig. 1. This specimen (Fig. 3) has been made from a piece of tabular flint, and its upper and lower surfaces are represented by unflaked cortex. The flaked areas of the specimen are of a deep chocolate brown colour, and exhibit a well marked glaze or gloss. The edge-flaking which has given to the stone the well-marked pointed form is considered to be the result of blows. The specimen which measures in greatest length (A – B) $1\frac{11}{16}$-in., greatest width (C – D), $2\frac{1}{8}$-in., greatest thickness $\frac{11}{16}$-in. exhibits neither incipient cones of percussion or striæ upon its flaked surfaces, nor does it appear to have been subjected to the smoothing action of running water. The original surfaces of the flint, which are more ancient than the flaking which has produced the present pointed form, show however some little amount of abrasion.

Fig. 4. Provenance the same as specimen represented in Fig. 2. This specimen (Fig. 4) has been made from a piece of tabular flint, and its upper and lower surfaces are represented by unflaked cortex. The flaked areas of the specimen are of a chocolate brown colour. The edge-flaking which has provided the flint with a more or less straight cutting edge is considered to be the result of blows. The specimen which measures in greatest length (A – B) $2\frac{3}{8}$-in., greatest width (C – D) $1\frac{5}{16}$-in., greatest thickness 1-in., exhibits a few incipient cones of percussion upon its flaked surfaces, and some small striæ are to be seen upon some of these surfaces. It would appear that the specimen has been subjected to some amount of rolling by water action as the edges and sharp angles of the stone are somewhat abraded.

It is of course possible that some of this abrasion may have been caused by the slight amount of pressure to which the stone has been subjected, and to which the small striæ mentioned bear witness.

Fig. 5. Provenance the same as specimens represented in Figs. 2 and 4. This specimen (Fig. 5) has been made from a piece

of tabular flint which exhibits unflaked cortex over nearly the whole of its upper surface. The lower surface exhibits the hard unflaked interior of the flint, and is made up of several fracture-surfaces which have in all probability been produced by thermal action. The under surface of the stone is of a chestnut brown colour, while the upper unflaked surface is of a café-au-lait shade. The edge-flaking, which has provided the flint with a more or less straight cutting edge, is considered to be the result of blows. This edge-flaking exhibits a well marked glaze, it is not stained and shows the almost unchanged black interior of the flint. The specimen which measures in greatest length (A – B) $3\frac{7}{16}$-in., greatest width (C – D) $2\frac{13}{16}$-in., greatest thickness 1-in., exhibits no incipient cones of percussion upon its surfaces, but the lower thermally broken surfaces exhibit a few small striæ. The stone appears to have suffered some amount of abrasion, but at a time prior to that to which the edge flaking is referable. The flaked areas marked L in the illustration are recent fractures.

FIG. 6. Provenance the same as specimens represented in Figs. 1 and 2. This specimen (Fig. 6) has been made from a tabular shaped flint, and exhibits unflaked cortex over the whole of its upper and lower surfaces. The upper surface of the specimen is lightish brown in colour, while the lower shows little or no staining. The edge-flaking which has provided the flint with a more or less straight cutting edge, shows a well marked glaze, and is considered to be the result of blows. The flaked areas of the stone are toffee-coloured. The specimen, which measures in greatest length (A – B) $2\frac{11}{16}$-in., greatest width (C – D) $1\frac{7}{16}$-in., greatest thickness $\frac{5}{8}$-in. exhibits neither incipient cones of percussion nor striæ upon its surfaces. The flint shows little or no signs of abrasion.

FIG. 7. Found upon the sea-beach at Lowestoft, Suffolk. This specimen which is of a dark chocolate brown colour, with a slight blueish tinge upon its upper surface* has been formed, so far as its larger fracture-surfaces are concerned (marked T in drawing) by thermal action. The edge-flaking ,which is of a different order from that exhibited by the specimens hitherto described, is considered to be the result of blows. The specimen, which measures in greatest length (A – B) $3\frac{5}{16}$-in., greatest width $2\frac{11}{16}$-in., greatest

* The upper surface of the specimens is the surface which is figured.

thickness $1\frac{1}{4}$-in., is heavily abraded and exhibits numerous criss-cross striæ and incipient cones of percussion upon its surfaces.

FIGS. 8 and 9. Represent flints flaked by the author with another stone used as a hammer.

The above description, together with the illustration, will enable the reader to form a very good mental picture of the specimens under examination, and it is now proposed to apply the criteria obtained in the experiments in flint fracture mentioned above (Chap. I.) and to decide whether the edge flaking of the specimens illustrated in Figs. 1 to 6 is of human or natural origin.

The first question for decision is the nature of the force which has produced this edge-flaking, whether percussion or pressure. The author does not consider there can be much doubt that percussion has been the agent of fracture. An examination of the edge-flaking reveals no evidence of the effects of pressure, while all the characteristics of flaking by percussion are, on the other hand, abundantly observable.

There are no " opposing cones of pressure " such as are produced when a stone is subjected to pressure between two resistant surfaces, while the fissures and ripple-marks developed upon the flake-scars are not such as are produced by the effects of pressure. Moreover, the ridges between the flakes are well marked, giving to the flaked edge a somewhat uneven appearance, and it has been ascertained that this prominence of the ridges between the flakes is very seldom, if ever, produced by pressure. It seems then, that the effects of pressure may be eliminated in our enquiry as to the origin of the edge-flaking of the specimens illustrated in Figs. 1 to 6, and it is obvious that Fig. 7 represents a stone edge-flaked by percussion. The scope of the enquiry being thus narrowed down we may proceed to try to ascertain whether the blows, which were responsible for the edge-flaking upon the specimens mentioned, were delivered by human or natural agency.

The next point to which attention is drawn is the direction of the arrows which appear on each flake area of the flints illustrated. It will be remembered that in the experiment in which flints were subjected to the effects of fortuitous percussion, it was found that the flakes removed from the edges of the stones had been detached at divergent angles, and it was pointed out that while it seemed reasonable to suppose that haphazard blows would strike the edge of a flint at different angles, the flakes removed by a human being using a hammer stone, would be taken off at a constant angle to the edge.*

If the reader will now examine the illustrations it will be noticed that while Figs. 1 to 6, Pl. 3, show that the force which acted on the edges of the flints removed the flakes at a constant angle to those edges, Fig. 7, Pl. 3, which was picked up on the sea-beach at Lowestoft, has had the flakes removed from its edge at divergent angles. It will be noticed also that in Figs. 8 and 9, Pl. 3, which represent flints flaked by the author by means of another stone used as a hammer, the specimens have had the flakes removed from their edges at a constant angle. It appears, then, that these flints (Figs. 1 to 6, Pl. 3) have been flaked along their edges by blows, and that these blows have been delivered at a constant angle to those edges. It is also noticeable that Figs. 8 and 9, Pl. 3, which represent specimens flaked by the author with a hammer-stone, have had their flakes removed at a constant angle to the edge. The specimen represented by Fig. 7, Pl. 3, on the other hand, which was found upon a shingle beach, where natural percusson has opportunities for operating, has had its flakes removed at divergent angles to its edge. This evidence points to the conclusion that the edge-flaking of the specimens illustrated in Figs. 1 to 6, Pl. 3, is of human origin, but we will proceed to a further examination of the flaking to ascertain if this conclusion is supported by other evidence. In the experiment in which flints were subjected to the effects of fortuitous percussion by shaking them in a sack, it was noticed that the flakes removed from the edges of the stones differed in appearance from others removed by human blows. These differences were :—

(*a*) The squatness of the fortuitous flakes as compared with those removed by human agency.

(*b*) The fact that the former had cut deeper into the flint, causing a step or ledge to appear at the point of their final separation from the parent block.

(*c*) The occurrence of numerous prominent ripple-marks upon nearly all the flakes produced by fortuitous blows, as compared with their comparative scarcity upon the "human" flakes.

* The methods by which the direction of each blow removing a flake was ascertained, were described fully in Chapter I., and need not be recapitulated here.

When the specimens illustrated in Figs. 1 to 6, Pl. 3, are examined, it is seen that the flakes removed from their edges are not squat, nor have they cut deeply into the flint, giving rise to a step or ledge at the point of their final separation from the parent block. And in these particulars they agree with the specimens illustrated in Figs. 8 and 9, Pl. 3, which were flaked by the author. The edge flaking of the Lowestoft beach specimen, however, exhibits both the characteristics mentioned, and approximates very closely to the edge-flaking produced upon the flints in the sack experiment. The fractures forming the flaked edges of the specimens illustrated in Figs. 1 to 6, Pl. 3, also do not exhibit numerous, prominent ripple-marks upon their surfaces, such as are so frequently produced by fortuitous blows, while the Lowestoft beach specimen (Fig. 7, Pl. 3) shows well-developed ripple-marks upon five out of its seven flake-scars. In the case of the two specimens flaked by the author, prominent ripple-marks upon the flake-scars are very infrequent. It will probably be remembered that in the sack experiment to which reference has been made, it was noticed that the edges of the flaked stones tended to assume a sinuous outline due to blows having fallen upon either side of these edges.

In the specimens illustrated in Figs. 1 to 6, Pl. 3, the blows which have produced the edge-flaking have all been delivered from one side of the flint only, and in consequence no sinuosity of the edge is observable. This is also the case with the specimens flaked by the author. (Figs. 8 and 9, Pl. 3).

The flaked edge of the Lowestoft specimen (Fig. 7, Pl. 3) shows a distinct tendency to assume a sinuous outline, due to blows having removed flakes from both sides of that edge.

The specimens illustrated in Figs. 1 to 6, Pl. 3, do not exhibit an undue number of truncated flakes removed from their flaked edges,* and in the case of the Lowestoft beach specimen (Fig. 7, Pl. 3) there do not appear to be many developed, though the edge is so battered as to make a certain diagnosis impossible. The specimens flaked by the author (Figs. 8 and 9, Pl. 3) do not show an undue number of truncated flakes removed from their flaked edges.

* The number of truncated flakes removed from the edge of a flint was seen to indicate whether the specimen had been flaked by man or by nature.

The foregoing examination has shewn that the primitive edge-flaked flints illustrated in Figs. 1 to 6, Pl. 3, exhibit the following characteristics which are believed to be associated only with human intention.

(*a*) The flakes removed from their edges are the result of blows which have been delivered at a constant angle to these edges.

(*b*) The flakes are not squat, nor do they cut deeply into the flint, causing a step or ledge to appear at the point of their final separation from the parent block.

(*c*) The flake-scars do not exhibit numerous and prominent ripple-marks upon their surfaces.

(*d*) The flaked edges do not exhibit a sinuous outline, nor do they shew an undue number of truncated flakes removed in the formation of these flaked edges.

The specimens flaked by the author (Figs. 8 and 9, Pl. 3) agree in every particular with the above specimens. The Lowestoft specimen (Fig. 7, Pl. 3) found upon a shingle-beach, does not, however, exhibit edge-flaking of the same order as the specimens illustrated in Figs. 1 to 6, Pl. 3, but the flaking approximates very closely to that produced by fortuitous percussion in the sack experiment described. The author is of opinion that the foregoing examination indicates that the primitive edge-flaked flints selected for illustration (Figs. 1 to 6, Pl. 3) are of human origin, and that such specimens deserve the closest attention of all serious prehistorians. In future, the old unscientific attitude towards these primitive and very ancient flaked flints must be abandoned, and their acceptance or rejection as the work of man based upon some tangible evidence such as has been set forth in this chapter.

Chapter III.

THE RELATIONSHIP OF THE MOST ANCIENT FLINT IMPLEMENTS TO THE LATER RIVER-DRIFT PALÆOLITHS.

There are very few serious pre-historians of the present day who believe that the earliest palæolithic implements of the river-drift represent man's first efforts to fashion flints to his needs.

If a typical example of these implements be examined, it will be recognised at once that the specimen owes its outline and form to a series of dexterous blows, delivered by someone with a very definite idea of the kind of implement he wished to produce, and a thorough grasp of the art of flint flaking. It would seem to be contrary to reason and experience to suppose that some primitive being in the remote past, should, without any prior knowledge of the flaking of flint, be able to produce such a specimen. And this opinion is strengthened if we try to conjecture what a present-day member of the human race would be able to accomplish in implement making under similar circumstances. Let us suppose that such a person having no knowledge of the fracture of flint, and who had never seen or heard of such things as flint implements, was confronted with a block of flint and a hammer-stone.

It may be supposed also, that the present day representative of mankind would possess a brain more alert and receptive than his ancient and untutored ancestor. And yet even with this very great advantage is it possible to believe that the modern person would be able to produce a symmetrical and well-flaked palæolith? The answer to this question must, in the author's opinion, be a decided negative, and he considers that there is no reason to believe that any ancient and primitive member of the human race would, under the same circumstances of ignorance, be any more successful.

It seems then that the earliest palæolithic implements cannot represent man's first efforts in flint flaking, but are, in all probability, the outcome of long periods of time, during which a slow process of evolution in flint implement making was in progress. And this seems a reasonable supposition. The flaking of flint is an art, one which might perhaps be termed an "industrial art," and we are all aware that most, if not all, art has slowly evolved, and is still evolving. It is no doubt somewhat difficult for us, who are familiar with all and every form of elaborately flaked flint implements, to realise that the person who made the first and most primitive edge-trimmed scraper or borer was, no doubt, regarded by the other members of the horde as an expert flaker of flint. He was as a matter of fact much more than that, he was a discoverer, a maker of new knowledge, which was to be of enormous value to his contemporaries and to those who lived after him. And so it was with all advances in implement making: they must have been epoch marking in the same way as great advances in various ways are at the present day. There seems little doubt from the scanty signs of improvement in the flint implements of any given geological horizon, that evolution in implement making proceeded very slowly. But this need not necessarily cause surprise when the lack of incentive to progress, and the general low standard of mental power of the primitive human beings are considered.

In the present paper the author desires to draw attention to the apparent relationship of the most ancient and primitive edge-trimmed implements (generally known as "eoliths"), to the later and more highly evolved palæoliths of pointed and ovate form such as are found usually in river-terrace gravels, etc.

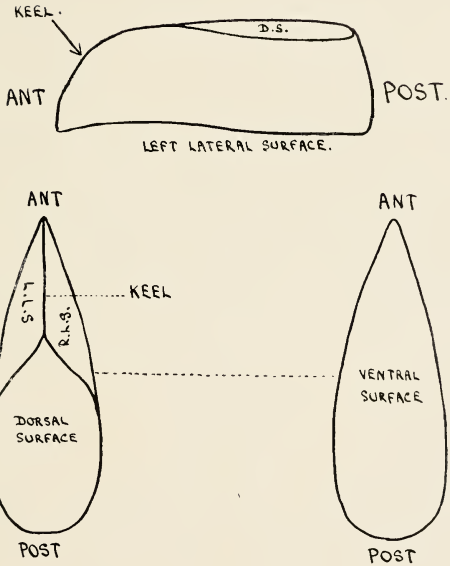
It has generally been held that the beds containing the pre-palæolithic implements were separated by a considerable period of time from those in which the normal palæoliths occur; and this may or may not be true. The author is, however, concerned solely with the form and flaking of the various specimens described in this chapter, and the somewhat complex geological problems involved in their provenance must be left to others for solution.

But before proceeding to describe these specimens it is necessary to write a few lines on the question of flint flaking. To everyone who has taken the trouble to flake flint, it has become clear that to be able to detach flakes with precision, it is necessary to have a flat surface upon which to deliver the necessary blows. It is almost impossible to detach flakes from a rounded surface of flint owing to the fact that the hammer-stone cannot "get home," so to speak, but glances off ineffectively. There is no doubt that the necessity for a flat surface of flint in flaking was one of the first discoveries made by man, in his earliest efforts to shape flints to his needs. The most ancient edge-trimmed stones, as has been shown, are almost invariably of a tabular form, and it seems that these stones were selected because they afforded two naturally formed broad, flat surfaces upon which to deliver blows with a hammer-stone. As time went on, it was found possible to produce the necessary flat surface by flaking, and this production of a "striking-platform" was, and always must be, one of the fundamental necessities in flint implement making. In the author's opinion the rostro-carinate or "Eagle's-beak" type of implement plays an important part in the evolution, which it is the intention of this chapter to describe.* (These particular specimens were first found by the author in 1909, in the detritus-bed below the Pliocene Red Crag of Suffolk, and have been described fully by Sir Ray Lankester and by himself). It seems necessary, therefore, to give an accurate description and drawing of an ideal rostro-carinate implement, such as the ancient flakers of flint apparently had in their mind, but to which ideal they did not often attain.

The following description is copied from that given in Sir Ray Lankester's Memoir (*Phil. Trans. Roy. Soc.*, May, 1912), and the accompanying drawing of an ideal rostro-carinate is also taken from the same publication.

"A rostro-carinate is an implement with broad posterior region, narrowed anteriorly to a quasi-vertical cutting edge. This anterior narrow edge is strongly curved and gives the implement the form of the beak of an accipitrine bird. The form of this region of the implement may also be compared to that of the prow of a boat (the boat being turned keel upwards). If the implement is held with the prow or beak to the front, there are observed an upper or dorsal plane, a lower or ventral plane, a right lateral and left lateral surface, a posterior surface or stern and an anterior surface,

* See *Journal of the Royal Anthropological Institute*, Vol. XLVI., January-June, 1916. *Phil. Trans.*, B Vol. 209, 1919 (in course of publication).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LEFT LATERAL SURFACE.
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KEEL
DORSAL
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ANT
VENTRAL
SURFACE
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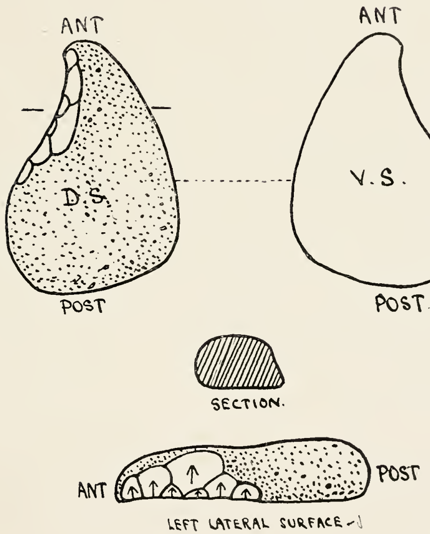
Fig. 1


ANT
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SECTION.
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POST
LEFT LATERAL SURFACE

FIG. 2.

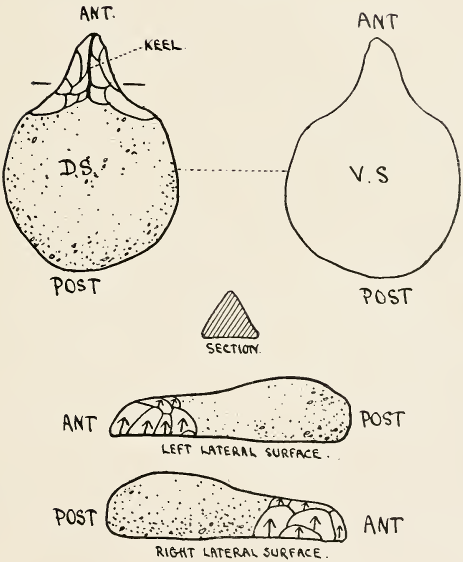
narrowed to the form of a keel and ending in a beak (hence the term "rostro-carinate") as a consequence of the oblique direction and convergence of the lateral surfaces, which approach one another so as to leave only a narrow keel-like ridge between them (see Fig. 1, Plate 4)." It is proposed to indicate in each text figure the anterior (ANT) and posterior (POST) region of each specimen portrayed. The upper, dorsal surface and the lower, ventral surface, will be indicated by the letters D.S. and V.S. respectively, while the left lateral surface (L.L.S.) and the right lateral surface (R.L.S.) will also be delineated. A sectional drawing of each implement will also be given.

The "keel" of the specimens exhibiting this feature will be indicated clearly, and the author thinks that the drawings will be readily understood by the reader. The arrows marked in on the flake-scars of the specimens indicate the direction of the blows which removed the flakes.

Fig. 2, Plate 5. The most primitive type of flint implement known is here represented. It is simply a more or less tabular piece of flint, the dorsal surface of which exhibits unflaked cortex, while the ventral surface shows the hard interior of the flint which has become exposed owing to a clean, thermal fracture. On one side of this flat, thermal surface, blows have been delivered and flakes removed, so that a hollow has been produced in the edge of the stone, which encroaches on the dorsal surface. It will be noticed that all the arrows marked in on the flake-scars of this hollow, which forms part of the left lateral surface of the implement, point away from the flat ventral surface, demonstrating that the maker of the implement delivered all his blows upon this flat surface. And anyone experienced in the flaking of flint would follow his example, as the more uneven dorsal surface would afford a much less satisfactory striking-platform, upon which to deliver flake-removing blows with precision. The specimen is D shaped in section. Such an implement would be of service for scraping purposes, and the type is frequently met with in the high level plateau gravels of Kent, and in other ancient deposits of supposedly pre-palæolithic age.

Fig. 3, Plate 6. Represents another very primitive type of flint implement often found in association with the form represented in Fig. 2, Plate 5. This specimen (Fig. 3), however, exhibits an advance on the first described implement. It will be seen that another hollow has been flaked in the side of the stone opposite to that shewn in Fig. 2, Plate 5, and that the specimen has now assumed a definite pointed form. The production of this extra hollow would have provided the ancient flint flaker with two scraping edges instead of one, and it is the author's opinion that this was the result which he wished to attain. The pointed form was simply the inevitable result of the production of the two opposing hollows. But there was also another inevitable result, and one which, apparently, had a great effect in the evolution of flint implements. As the respective flake-scars of the two hollows encroached upon the dorsal surface of the specimen and finally met, a ridge or gable was formed (marked "KEEL" in drawing). It does not appear probable that the formation of this keel was the object of the ancient workman, but that it was the inevitable outcome of the production of the two hollows, as anyone can easily prove if they flake a flint to the form of the specimen represented in Fig. 3. But it was not long before the possibilities of this sharp keel being used as a cutting-edge, and its superiority as such over the cutting-edges in use previously, were recognised, and from then onwards the efforts of these early flint-flakers appear to have been directed to the production of such "keels" or cutting edges. The right lateral and left lateral views of the specimen show that, as in the implement represented in Fig. 2, Plate 5, all the blows forming the two hollows were delivered on the flat ventral surface. A glance at either of these lateral views will show also that the anterior region has already assumed in profile the appearance of a beak, and is prophetic of the later rostro-carinate specimens. This beak-like appearance is again attributable to the production of the two opposing hollows, and is the almost inevitable result of such production, as can easily be tested by anyone desirous of doing so.

The section of the specimen is triangular. The base of the triangle representing the ventral surface, the two sides the right lateral and left lateral surfaces respectively, while the apex represents the keel or gable formed by the convergence of the flake-scars, forming the two opposing hollows. It will be noticed that both the implements represented in Fig. 2, Plate 5, and Fig. 3, Plate 6, are fashioned from pieces of tabular flint which provided naturally formed striking-platforms for the delivery of flake-removing blows.


ANT.
KEEL
D.S.
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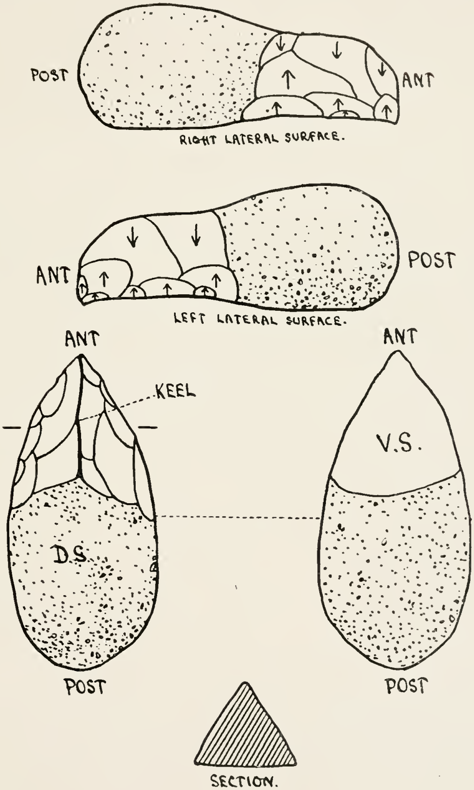
RIGHT LATERAL SURFACE.

FIG. 3.


POST
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KEEL
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ANT
V.S.
POST
SECTION.

FIG. 4.

Fig. 4, Plate 7. Represents a rostro-carinate or eagle's beak implement such as is found in the detritus-bed below the Pliocene Red Crag of Suffolk.

It appears that at the time when these implements were fashioned tabular flint was not obtainable, as the author has not yet found a sub-Crag rostro-carinate made from a piece of tabular flint, and the extensive diggings which have been conducted have shewn that this particular kind of flint is very rare in the detritus-bed.

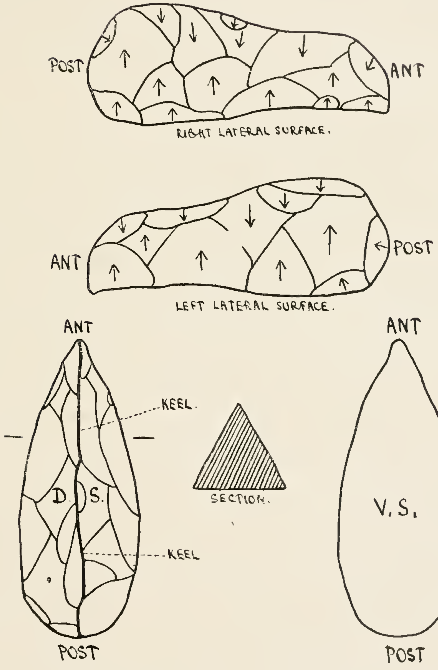
The pre-Crag people, however, had an abundance of flint of very fine quality, in the form of nodules, with which to work, but the more or less rounded surfaces of nodules did not afford a satisfactory striking-platform, and so they had to learn to provide themselves, by flaking, with a flat surface upon which blows could be struck with precision. There is no doubt that the sub-Crag rostro-carinate implement, though generally much larger and of a more imposing appearance than the primitive implement represented in Fig. 3, Plate 6, is nevertheless made on almost precisely similar lines. The ventral surface of the rostro-carinate formed by the removal of a large flake from the original flint nodule, represents the natural flat surface of tabular flint, and in both cases blows were delivered on each side of this flat surface. But whereas it seems that in the case of the primitive implement represented in Fig. 3, Plate 6, the result aimed at was the production of two scraping hollows, in the rostro-carinate the keel or gable seems to have been the desired object.

It will be noticed that there is a slight difference in the method of production of the rostro-carinate from that of the implement represented in Fig. 3, Plate 6. In the latter all the blows were delivered on the flat ventral surface, and while this is the case with most of the blows which went to form the keel of the rostro-carinate, yet one or two were delivered on the dorsal surface of the specimen. The author has found by many experiments in flint flaking that in forming the keel it is sometimes necessary to deliver some blows on the dorsal surface. The section of the rostro-carinate implement is triangular as in the case of Fig. 3, Plate 6.

Fig. 5, Plate 8. It has been noticed, from an examination of a number of rostro-carinate specimens found in deposits of less antiquity than the detritus-bed below the Pliocene Red Crag, that the ventral surface, or "striking-platform" as it might be termed, was gradually extended further backwards towards the posterior region of the implement.

This extension of the ventral surface made possible the corresponding extension of the keel, until an implement was produced having a cutting edge extending the whole length of its dorsal surface. Such a specimen is illustrated in Fig. 5, Plate 8. The section of this implement is still triangular, and the majority of the blows forming the keel were delivered upon the flat ventral surface. Several specimens of this type have been found from time to time in river-gravels associated with early palæolithic implements, and long before rostro-carinates were discovered, were collected and preserved as "side-choppers." But there can be little doubt that such specimens are simply rostro-carinate implements in a high state of development, and, moreover, their method of manufacture is fundamentally the same as that followed in the production of the more primitive implements illustrated in Fig. 3, Plate 6, and Fig. 4, Plate 7. This fact can be easily corroborated by anyone prepared to experiment in flint flaking on his own account.

Fig. 6, Plate 9. It seems that the palæolithic workmen having realised the advantage of a cutting-edge extending the whole length of the dorsal surface of their implements, realised also that it would be a great advantage to have at their disposal another and opposing cutting-edge. We have seen that so far in implement making the flat ventral surface had been an absolute necessity for the production of the required cutting-edges. On this ventral surface or striking platform the majority of the blows had been delivered, and it was the presence of this same flat surface which made it possible for the palæolithic workman to develop his implements still further. If a number of the earliest palæoliths are examined it will be noticed that they are roughly rhomboidal in section, and thus differ from the triangular form of the implements represented in Fig. 4, Plate 7, and Fig. 5, Plate 8. Fig. 6, 5a, Plate 9, shows how, in all probability, this change from the triangular to the rhomboidal form was brought about. The two areas at the base of the triangle limited by dotted lines were removed by blows delivered principally upon the flat ventral surface, or base of the triangle, and a cutting edge C formed


POST
ANT
RIGHT LATERAL SURFACE.
ANT
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LEFT LATERAL SURFACE.
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KEEL.
D. S.
KEEL
POST
SECTION.
ANT
V. S.
POST

FIG. 5.

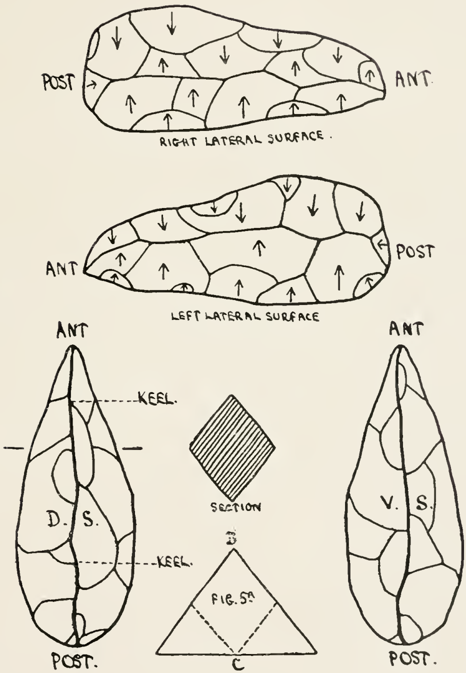

POST
ANT.
RIGHT LATERAL SURFACE.
ANT
POST
LEFT LATERAL SURFACE
ANT
KEEL.
D. S.
KEEL.
POST.
SECTION
B
FIG. 5a
C
ANT
V. S.
POST.

FIG. 6.

in opposiiton to that at B, which, as we have seen, was the keel of the more primitive type of implements.

The author has been able to examine a large number of early palæolithic implements in various public and private collections, and has recognised many specimens which, though exhibiting the two cutting-edges of the normal palæolith, nevertheless show in their profile a marked resemblance to the profile of the rostro-carinate implements. (Fig. 6, Plate 9). That is to say that one edge of these early palæoliths is markedly curved towards the anterior region of the implement, while the other edge is much straighter.* He has noticed also that many of these specimens exhibit the remains of either the dorsal or ventral surfaces of the rostro-carinate form. Such a resemblance would be expected if the palæoliths were evolved from the rostro-carinates, and it is very significant that such forms should occur so freely in the earliest palæoliths which are nearest in point of time to the rostro-carinates.

The author has experimented extensively in the flaking of flint, and has himself produced flint implements of early palæolithic type by following the procedure outlined above. He has found also that in several cases the outline of the rostro-carinate form has been preserved, and that the remains of either the dorsal or ventral surfaces of the rostro-carinate are sometimes left at the butt-end or anterior region of the implement. It has been the custom to figure and regard palæolithic implements with their points uppermost, and in consequence the remains of the dorsal or ventral surfaces have been spoken of as " lateral platforms." But if these specimens are regarded with the point to the left, or the right as the case may be, these platforms are no longer lateral, but dorsal or ventral, and their true significance can be recognised.

Fig. 7, Plate 10, uppermost figure. This drawing represents a highly evolved palæolithic implement in which both edges are symmetrical, and the likeness to the ancestral rostro-carinate form has almost disappeared.

Fig. 7, Plate 10, middle figure. Represents an ovate palæolithic implement. These implements which were made on precisely the

* The downward curvature of one edge represents the curving of the keel towards the anterior region, while the straighter edge represents the flat, ventral surface of the rostro-carinate form

same plan as the pointed examples, owe their ovoid shape to the substitution of a rounded cutting edge for the pointed end, and their evolution may be due to the breaking off of the area indicated by crosses, and the re-chipping of the broken end into a curve instead of a point. Ovate palæoliths often exhibit a "lateral platform," which as has been shown is probably the remains of either the dorsal or ventral surfaces of the rostro-carinate implement.

The chief points of this chapter may be summarised as follows :

(1). The most primitive implement known is a tabular piece of flint with a hollow flaked out in one of its edges.

(2). The next stage is represented by a similar piece of tabular flint in which two opposing hollows have been fashioned in its edges. The flake-scars of these two hollows have converged and formed a keel or gable, and have also inevitably produced a beak-like profile at the anterior region of the implement.

(3). This keel or gable, and the beak-like profile, are still more marked in the sub-Red Crag Rostro-Carinate, and in the implements of this type found in deposits of less antiquity than the sub-Crag detritus-bed, the flat, ventral surface and the keel are gradually extended further back towards the posterior region.

(4). The extension of the keel culminates in the production of the early palæolithic side-chopper in which a cutting-edge extends continuously from the anterior to the posterior region.

(5). The triangular section of the pointed eolithic and rostro-carinate implements is transformed in the earliest palæoliths into a section which is roughly rhomboidal. This change was in all probability brought about by the removal by flaking of each side of the flat ventral surface of the rostro-carinate form, so that a thin cutting edge was left.

(6). These earliest palæolithic implements often exhibit a marked resemblance in their profile to the rostro-carinate form, and the remains of the dorsal or ventral surface of this latter type are often left at the butt-end of the implements. The remains of these surfaces have been called erroneously "lateral platforms."

(7). The most highly evolved palæoliths are those with straight symmetrical cutting-edges, in which the rostro-carinate profile has almost disappeared.

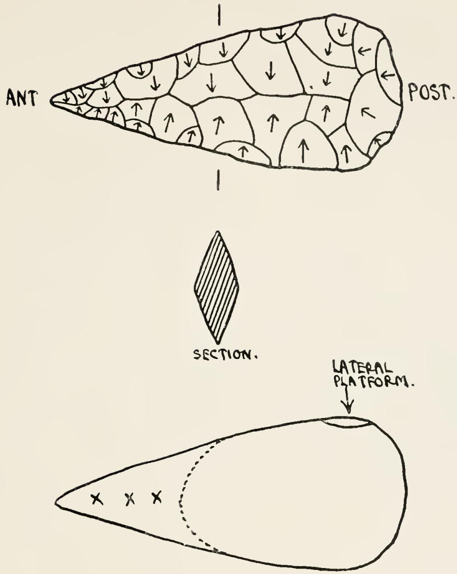


FIG. 7.

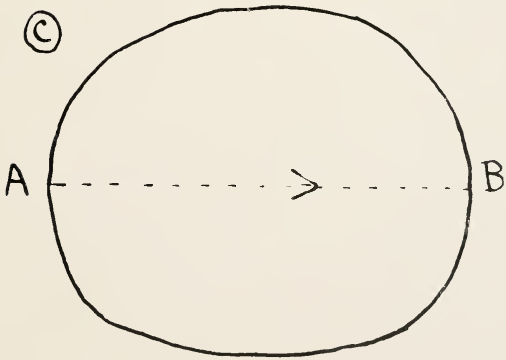


FIG. 8.

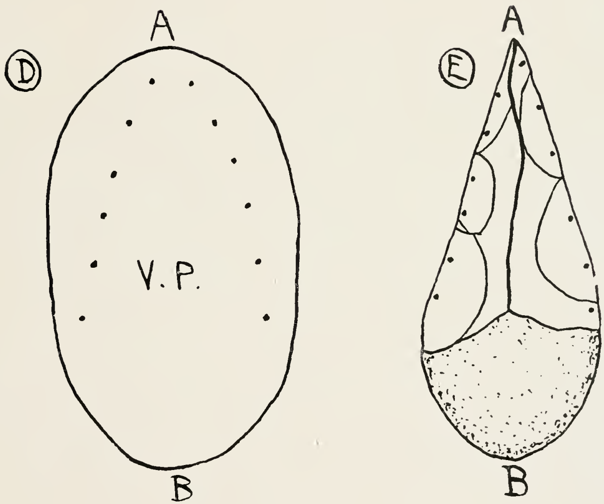


Fig. 9.

It will thus be seen that the author is of the opinion that the most primitive "eolithic" implement is linked up with and related to the most symmetrical and perfect palæolith of the river-drift deposits. It is also his opinion, as a practical flaker of flint, that there is no other way of making the implements figured, except that described in this chapter. But he does not claim infallibility, and it may be that some other investigator may be able to demonstrate a more accurate and better way.

Though a large number of the most ancient river-drift, palæolithic flint implements are of rhomboidal section, there is also a certain proportion of these specimens exhibiting a section which is triangular. We have seen how in all probability the former were derived from the ancestral rostro-carinate form, and it now remains to discuss the relationship of the palæoliths of triangular section to the rostro-carinate. This is not a very difficult matter as both forms of implement exhibit a triangular section, and it is clear that the palæoliths under discussion are really what may be termed "depressed" rostro-carinates. That is to say, that while in the latter form the keel or carina is high and prominent, in the former this feature, though present, is not by any means an outstanding characteristic. And whereas in the palæoliths of rhomboidal section the carina forms one of the cutting edges of the implement, in those of triangular section it has no functional use and the two lower angles of the triangle became the cutting edges. There is in fact no doubt that in its form and functional significance the palæolith of triangular section is very primitive. It reminds us of the early eolithic point of triangular section (Fig. 3, Plate 6) in which the cutting edges are formed by the lower angles of the triangle. But while it appears that, in the case of the eolithic points, these cutting edges were abandoned in favour of the sharp and well supported keel or carina, in the palæoliths under discussion, it seems that after passing through the rostro-carinate stage, a return was made to a form of implement which in its general plan, though not in the style of its flaking, approximates to the very ancient eolithic type. The method by which these palæoliths of triangular section were made is very simple, and follows in almost every particular that adopted in the manufacture of the rostro-carinate specimens. A rounded nodule of flint was first of all split in half by a blow delivered at the point "A" giving rise to a fracture extending to "B" (Fig. 8c,

Plate 10), and either of the two halves would be suitable for making into the desired implement. The necessary flat striking-platform (the equivalent of the " ventral plane " in the rostro-carinate forms) was provided by the fracture-surface produced when the nodule was split. Upon this surface flake-removing blows were delivered (approximately upon the areas indicated by dots in Fig. 9d, Plate 11) and the upper surface of the specimen formed (Fig. 9e, Plate 11). Thus an implement was produced on precisely the same lines as the rostro-carinate, but the keel or carina of which is not prominent nor a functional character. Specimens of the form described were made apparently *paripassu* with the true rostro-carinate type, as the implement shewn in Fig. 10, Plate 12, was found beneath the decalcified Red Crag, in the upper or East channel in Messrs. Bolton and Co.'s Brickfield, Ipswich. While Fig. 11, Plate 13, portrays a similar specimen found by Mr. W. G. Clarke upon the Norfolk Coast at Runton. This latter implement, though not found in situ, nevertheless by the characteristics of its flake-scars, patination and condition, was almost certainly derived from the basement bed of the Norwich Crag, which, moreover is often exposed by the action of the sea on that part of the coast. And it is common knowledge that flint implements of rostro-carinate form occur in the stone-bed beneath the Red and Norwich Crags. But while specimens such as are herewith figured (Fig. 10, Plate 12, and Fig. 11, Plate 13) have been found in these sub-crag deposits, no implements exhibiting a rhomboidal section, such as is possessed by some of the earliest river-drift, palæolithic artefacts, have been discovered, and at present the evidence available points to the latter being a later achievement on the part of ancient man.

A specimen found in the Thames Valley, in the neighbourhood of Gravesend, is shewn in Fig. 12, Plate 14, and this, as will be noticed, possesses the flat, unflaked fracture-surface, which was produced in the splitting of the original flint nodule from which the implement was made. Thus in this specimen we see an implement derived from a river gravel, which exhibits a triangular section, and a method of manufacture identical with that followed in the making of a rostro-carinate, and it may be stated that the flint, which with the others portrayed in this chapter are in the author's collection, presents a very archaic and ancient appearance.

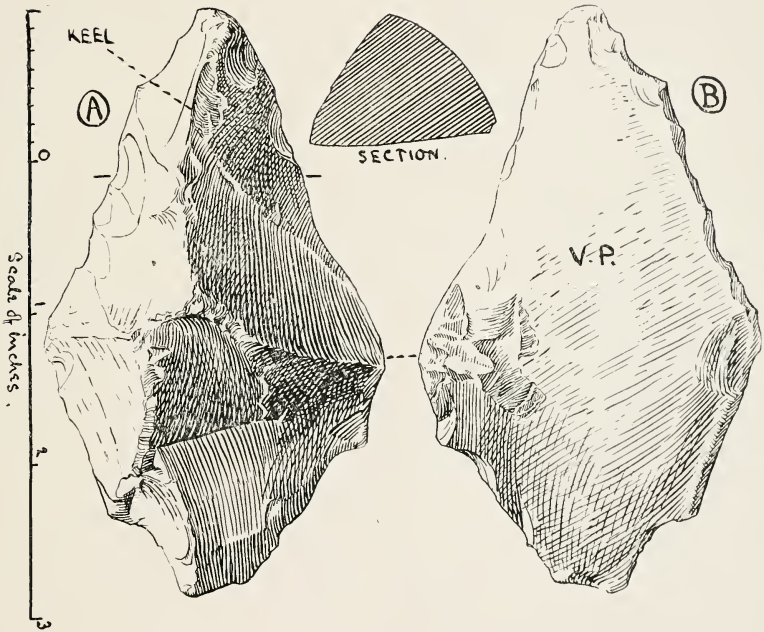


FIG. 10.

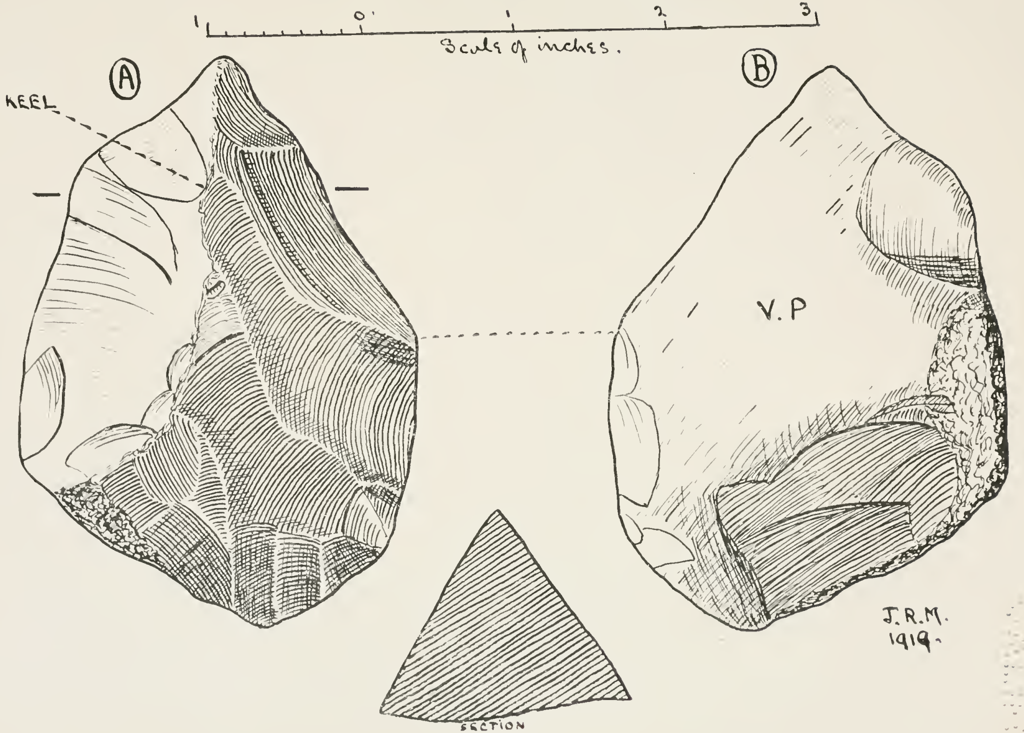


FIG. 11

In the specimen shewn in Fig. 13, Plate 15, a slight difference is observable in the method of their manufacture. After the upper surface of the implement was formed, blows were delivered (approximately upon the areas indicated in Fig. 9e, Plate 11, by dots), which had the effect of removing flakes from the ventral surface. It is somewhat difficult to understand why this particular method of flaking was adopted, as it would not seem that the resulting cutting edges were any more serviceable than those obtainable with a flat and unflaked ventral surface. An examination of these early palæolithic implements, shows that they were made from large flakes or chunks of flint, detached from nodules, and we may perhaps describe them as representative of a primitive flake industry. The ventral striking-platform is either retained entire (Fig. 10, Plate 12; Fig. 11, Plate 13; Fig. 12, Plate 14) or appears as a greatly truncated flake-scar upon the lower surface of the implement (Fig. 13b, Plate 15). These last mentioned specimens were found in the Thames Valley in the neighbourhood of Gravesend. In the drawings, the ventral plane or striking-platform is indicated by the letters V.P., while the position of the keel or carina is clearly defined. The sectional view of the specimens represents the form of the implements at the point indicated by horizontal lines. The author has seen in the collection of the late Dr. W. A. Sturge, a considerable number of palæolithic implements, almost precisely similar in their form and flaking to those here described, from Warren Hill, Suffolk; Shrub Hill, Norfolk; and the N.E. London gravels of the Thames Valley. He has also been able to himself fashion flints upon the plans described above, and the resulting implements are in all essential respects comparable with those under discussion.

Sir Ray Lankester has drawn the attention of the author to the fact, that the method by which the palæolithic implements of rhomboidal section were derived from the rostro-carinate, viz., by a gradual reduction in width of the ventral surface until it is replaced by a thin cutting edge (Fig. 15, Plate 15) is similar to the manner in which the plaice was evolved from the ancestral, squaloid fish. He therefore proposes the name "Platessiform" (Plaice-like) for the palæolithic implements thus derived.

Sir Ray Lankester has also pointed out that the manner in which the palæolithic implements of triangular section were probably derived from the rostro-carinate, viz., by a gradual depression of the keel or carina (Fig. 14, Plate 15), is similar to that by which the skate (*Raia batis*) was evolved from the squaloid fish, and he proposes the name "Batiform" for these particular palæolithic specimens. But in the giving of these descriptive names there is, of course, no wish to convey the impression that the makers of the ancient flint implements described, had a knowledge of the manner in which the evolution of the plaice and the skate took place, and fashioned their artefacts upon a similar plan. It would appear to be a mere chance that the platessiform and batiform implements were developed upon analogous lines to the plaice and the skate.

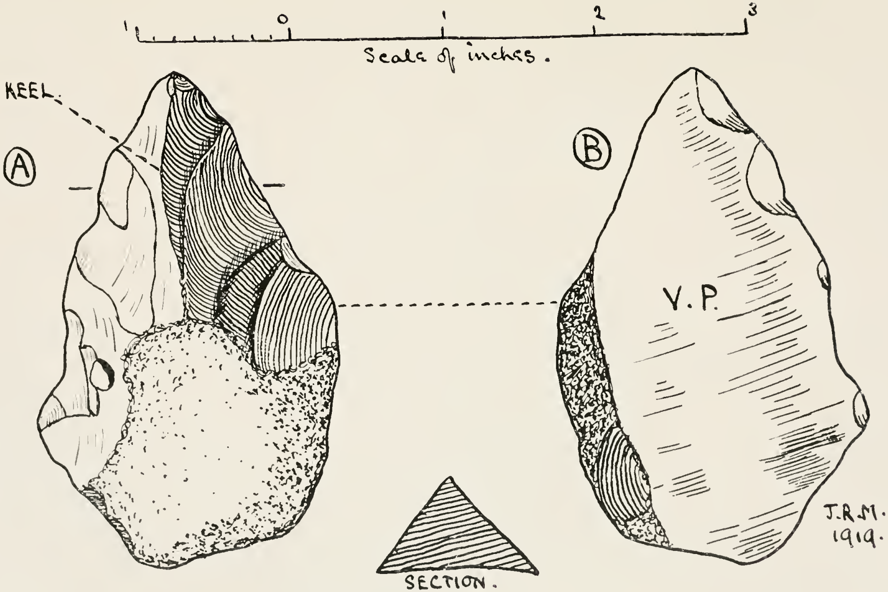


FIG. 12.

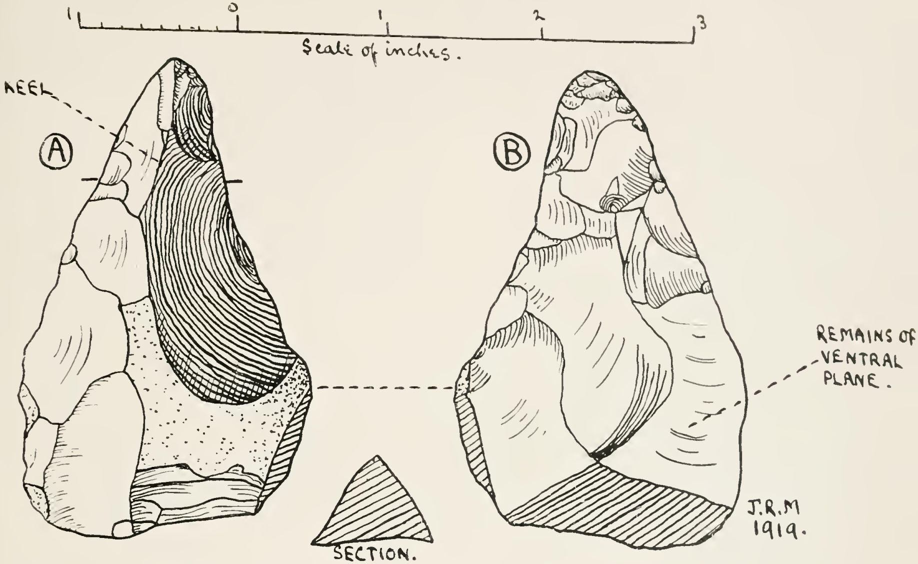
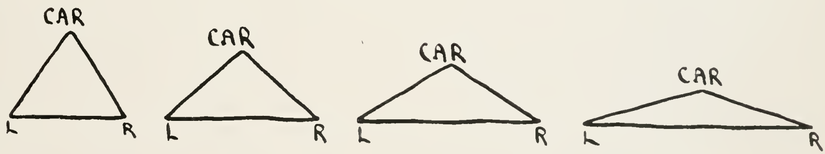


Fig. 13.

Fig. 14.



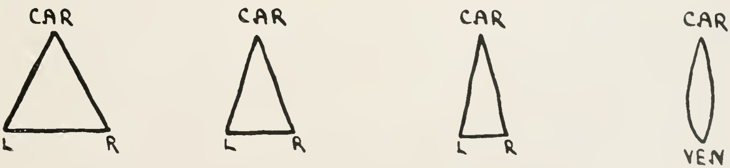


Fig. 15.

Chapter IV.

THE ANCESTRY OF THE MOUSTERIAN FLINT IMPLEMENTS.

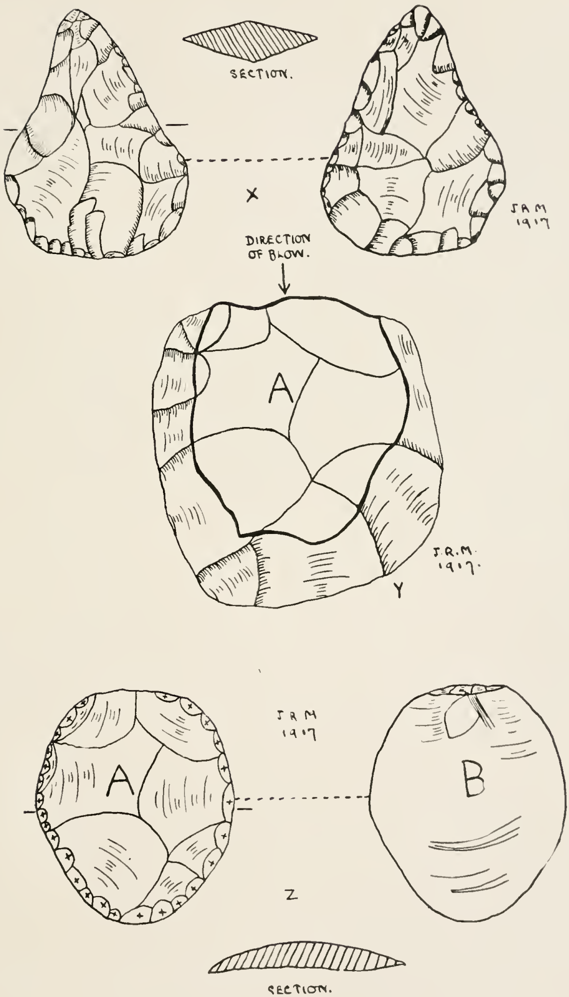
It is generally recognised by students of prehistory that with the close of Acheulean times a new method of flint implement making came into vogue. The Acheulean implements, which are found in various ancient valley and other deposits, represent the culmination of the long continued *coup de poing* or hand axe industry, in which the well-known pointed and oval palæolithic implements were made. These specimens were produced in most cases by so modifying a nodule of flint, by the removal of flakes, that the implement in its final form, represented as it were, the core or central portion of the original nodule.

The Acheulean specimens exhibit flaking over both their surfaces, (Fig. 1x, Plate 16) while those made during the next cultural stage, the Mousterian, show flake scars on one surface only ; and whereas in the Acheulean epoch the implement was made by the modification of an actual nodule of flint—in the Mousterian phase all the implements, with the exception of the few Acheulean forms found in the oldest strata, were formed from a flake struck from a nodule of flint previously prepared by flaking for such detachment. It is clear then that at the close of Acheulean times we witness a marked change in the manner of making flint implements. This change, moreover, is of such a fundamental character that many prehistorians realising its importance, conclude that the Mousterian implements were fashioned by a new race of people who gradually "absorbed" the Acheulean tribesmen. (See, for instance, *Commont's* "*Les hommes contemporains du Renne,*" pp. 97 and 131). If this were the case, as appears to the author to be in every way probable, it is clear that the newcomers adopted for a time some of the technique of the Acheuleans, as in the oldest Mousterian strata, implements of this former culture are found associated with typical

Mousterian specimens. But it would appear that this adoption did not find favour, as in upper Mousterian times the Acheulean hand axe gets very rare, and finally disappears never to return.

In a former chapter (Chapter 3) an account has been given of how in all probability the evolution of the palæolithic hand-axe came about. But the Mousterian implements present a new problem and their evolution must have proceeded on totally different lines from those of the normal palæoliths. There can, however, be no doubt that this evolution took place, and it is proposed, in this chapter, to put forward an explanation of it which appears to be in accord with reason and probability. The Mousterians, as we have seen, practised a flake industry, and in the most ancient deposits of this epoch specimens have been collected which demonstrate clearly the manner in which the industry was carried on. A nodule of flint was first of all "dressed" by the removal of large flakes, into a massive, steep-sided, disc-like form (flatter on one face than the other). After such preparation, a skilful and more or less heavy blow was delivered upon one or other of the steep sides of this prepared core, and in such a manner that a large flake was removed from the flat face already mentioned (Fig. 1YA, Plate 16). As the prepared core exhibited flaking all over the flat face, it is clear that the detachment of the flake would carry away some of this flaked surface, and the detached piece of flint would show on one side the truncated flake-scars of the parent block from which it was struck (Fig. 1ZA, Plate 16), and on the other the plain fracture-surface with bulb of percussion, produced when the flake was removed. (Fig. 1B, Plate 16). The piece of flint would show also a facetted striking-platform, due to the fact that the area upon which the blow fell, which was removed simultaneously with the flake, formed part of the flaked core. But the presence of such facetted striking-platforms would depend solely upon the degree of elaboration of the core by the ancient workman.

These flake-implements as they are called, after being trimmed into shape by secondary work round the edges (indicated by crosses in Fig. 1ZA, Plate 16, were used by the Mousterian people for the various purposes of their daily life. Two other forms of implements predominate in the Mousterian culture. The first is the *racloir* or side scraper (Fig. 3Z, Plate 18), the second the point (Fig. 4Z, Plate 19),


SECTION.
X
J.R.M.
1917
DIRECTION OF BLOW.
A
J.R.M.
1917.
Y
J.R.M.
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A
B
Z
SECTION.

FIG. 1.

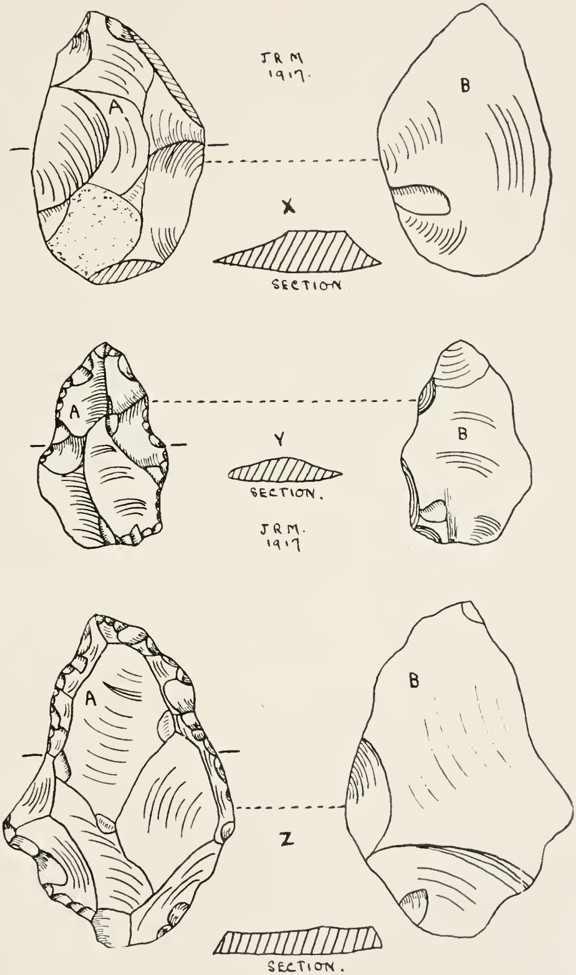


Fig. 2.

X—Sub Red Crag Flake-Implement.
Y—Middle Glacial Flake-Implement.
Z—Chalky Boulder Clay Flake-Implement.

both these implements being fashioned from flakes removed from prepared cores of a similar nature to that described above. The racloir presents one cutting edge, the point two, and it is supposed that the latter is in reality simply a double racloir the two cutting-edges of which have met and formed a point.

Now it is at present somewhat difficult to trace the evolution of the elaborately prepared core, from which the Mousterians struck their flake-implements. But this can be stated with certainty, viz., that flake-implements of a primitive type occur in Suffolk in the detritus bed below the Pliocene Red Crag,and in the Pleistocene, and supposedly pre-Acheulean Middle Glacial Gravel, and Chalky Boulder Clay. If the reader will refer to the drawing of a Mousterian flake-implement (Fig. 1A and 1B, Plate 16), and compare its main characteristics with those of the specimens derived from the above mentioned deposits (Fig. 2 X, Y and Z, Plate 17) he will at once realise the truth of this statement. In all the text figures of these flake implements, the letter "A" appears upon the surface upon which the truncated flake-scars of the parent block of flint are visible, while the letter "B" appears upon the plain bulbar surface produced when the flake-implement was detached. It is true that in the sub-Crag detritus bed, the Middle Glacial Gravel and the Chalky Boulder Clay, the cores from which these flake-implements were struck have not yet been found. But we know that such cores must have been made, and further research will no doubt bring them to light. We have seen that the most ancient flint implements were made from pieces of broken flint, of tabular form, presenting two naturally produced flat striking-platforms. On these platforms, flake-removing blows were delivered and the piece of flint fashioned to the required shape. We have seen also that as time went on the knowledge was acquired of the manner in which to make a flat striking-platform by intentional flaking. And it seems easy to imagine that in the manufacture of the sub-Crag rostro-carinate, flakes would be removed showing the truncated scars of previously struck flakes upon one of their surfaces, and that such flakes would be utilised as implements for scraping and other purposes. The author has in fact many times produced such flakes when making flint implements himself, and their production is indeed inevitable. We may presume that the ancient flint workers, having recognised the use to which these "fortuitously" produced flake-implements could be put, gradually acquired the knowledge to produce them at will, and thus the first prepared core came into existence. It will be seen, therefore, that the Mousterian flake-implement had its birth in far-off Pliocene times.

The origin of the racloir and point is equally remote. As has been shewn, both these implements were fashioned out of flakes struck from a prepared core and that the origin of such cores is of great antiquity. But the actual form of the racloir and point is even more primitive, for both are nothing more than the highly evolved descendants of the very ancient Kentian racloir and point.* To make this clear the author has illustrated a Kentian and Mousterian racloir side by side, and also a Kentian and Mousterian point. Now in both cases the Kentian implements were made from naturally broken pieces of flint, while the Mousterian specimens were fashioned from flakes struck from a prepared core. But this difference is of secondary importance in the present case. The salient fact is that we have four pieces of flint of more or less tabular form, which have been made into similar implements and we want to know how they were made.

In the case of the Kentian racloir (Fig. 3Y, Plate 18) blows were delivered upon the flattest side and near one of its margins, which resulted in the production of the necessary cutting edge. In the case of the Mousterian racloir (Fig. 3Z, Plate 18) blows were delivered upon the flat bulbar surface and near one of its margins, which also resulted in the production of a cutting edge. The Kentian point (Fig. 4Y, Plate 19) and the Mousterian point (Fig. 4Z, Plate 19) with two cutting edges were made in a similar manner to the racloirs. In both cases blows were delivered near the two opposite margins of the flat surfaces and the necessary cutting edges produced.

Thus it is clear that the Mousterian racloir and point are fundamentally primitive in their conception, and that their ancestral forms appear in the earliest implements of which we have any knowledge. Moreover, in the sub-Red Crag detritus bed, racloirs and points occur made from struck flakes, and these are still more marked and made more skilfully in the later Middle Glacial Gravel and Chalky

* The author is under the impression that this fact has been already mentioned by a previous writer or writers. But he has been unable to find the desired reference in any of the books at his disposal.

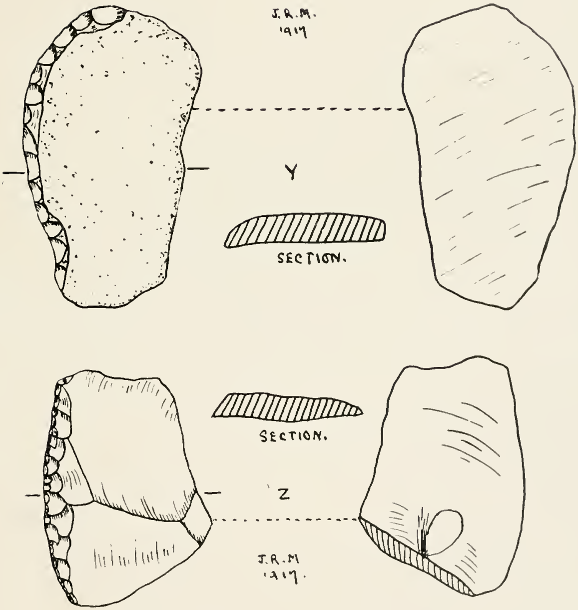


FIG. 3.

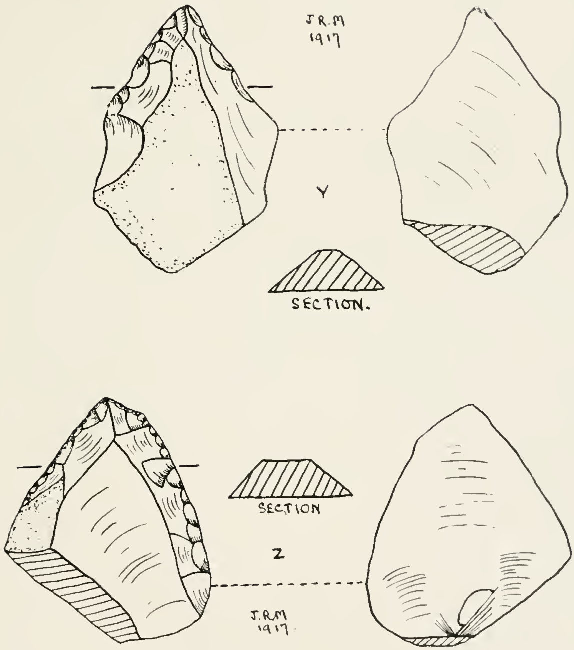


FIG. 4.

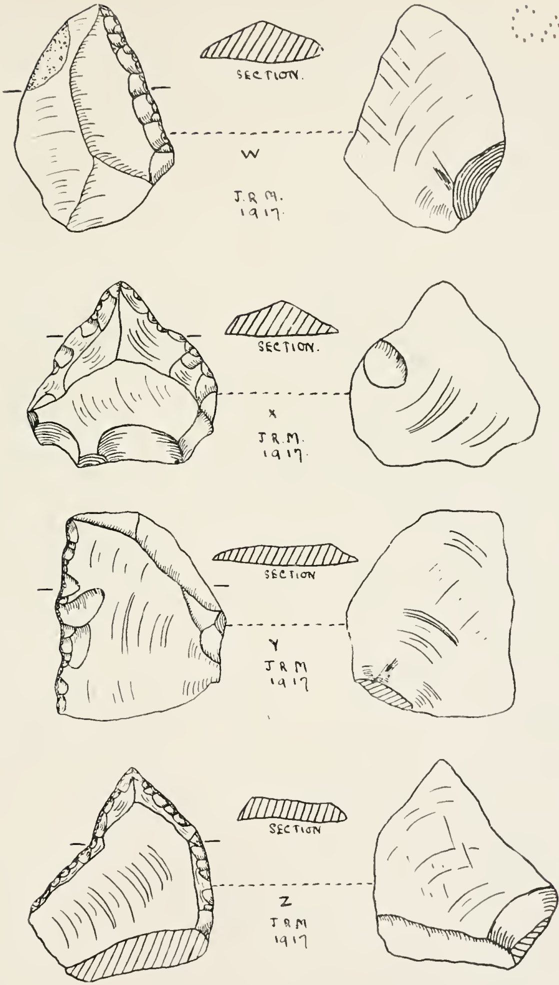


FIG. 5.

W—Sub-Red Crag Racloir.
X—Sub-Red Crag Point.
Y—Middle Glacial Racloir.
Z—Middle Glacial Point.

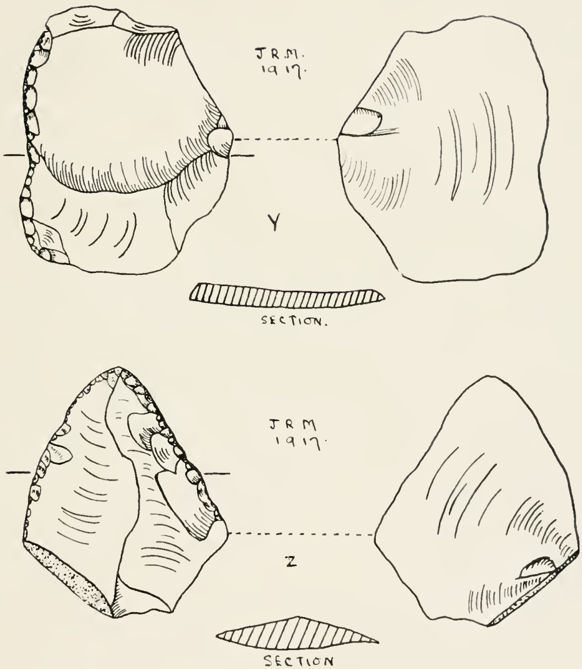


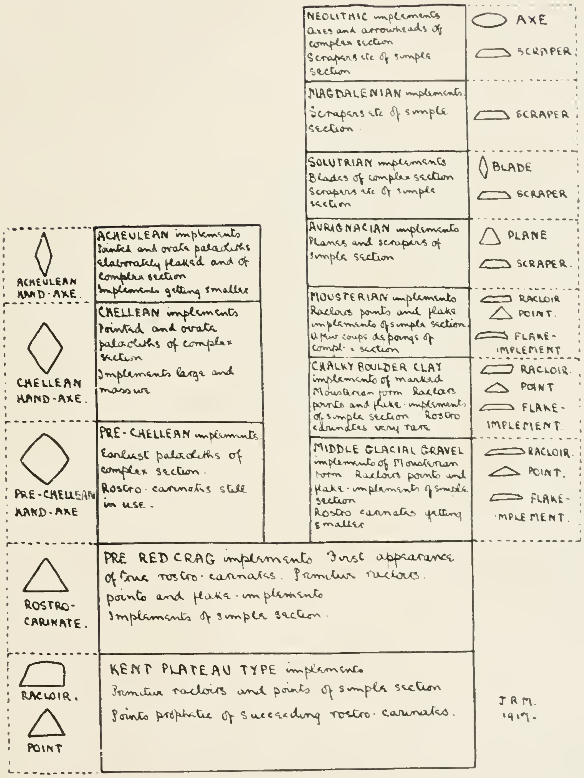
Fig. 6.

Y—Chalky Boulder Clay Racloir.
Z Chalky Boulder Clay Point.

Boulder Clay. (Fig. 5 Y and Z, Plate 20, and 6 Y and Z, Plate 21). But it is necessary to point out that the flaking forming the cutting edges of the Mousterian racloir and points is of a different order from that exhibited by the more ancient examples of these implements. This difference is due to the angle at which Mousterian man delivered his blows at the margin of the flat surface of the piece of flint he was manipulating, being different from that adopted by the more ancient workmen. This, however, is a minor matter in the present inquiry, and most of the racloirs and points recovered from the Chalky Boulder Clay exhibit moreover edge-flaking very nearly approaching in appearance the typical Mousterian workmanship.

As was pointed out in Chapter 3, the primitive Kentian plateau implements developed gradually into the rostro-carinate and finally into the normal palæoliths. We now see that it is probable, that these Kentian specimens were, by a different method of evolution, transformed into the well-known implements of Mousterian times. And there is another aspect to this question which appears to be of importance. The sections of the Kentian pointed implements and the sub-Crag rostro-carinates are more or less triangular; the flat base of the triangle having served as a striking - platform in the formation of the desired implement, and the implements retaining this original striking-platform as their base, the author proposes to describe as of "simple" section. But when the rostro-carinate developed into the palæolithic implement, with two opposite cutting edges the original striking-platforms having been flaked away, a more or less rhomboidal section was produced, and this the author proposes to call a "complex" section. Now, if we examine a series of Chellean and Acheulean palæolithic implements, it is at once clear that most of them present complex sections. If on the other hand, we examine a series of Mousterian, Aurignacian, Solutrean, Magdalenian and Neolithic specimens, we see that, with the exception of the Solutrean blade and the Neolithic axe and arrowhead, nearly all the typical implements of these cultures exhibit simple sections. This is a very remarkable fact and one which has tempted the author to prepare a chart (Fig. 7, Plate 22) showing the various cultures (which are given in the order in which they succeeded one another) from the primitive Kentian implements onwards, and indicating the type of section exhibited by the implements of these cultures.

At the side of each cultural division is given a small drawing of the section of the principal implements, and it seems that the Kentian implements led on to the sub-Crag culture, and it was then, so to speak, that the parting of the ways took place. In one case the sub-Crag rostro-carinate originating from the Kentian point, developed into the normal palæoliths with complex sections. In the other the Kentian racloir and point were preserved through the whole of the sub-Crag period, and, developing in the Middle Glacial Gravel and Chalky Boulder Clay epochs, reached their consummation in the Mousterian implements which exhibit simple sections. In the succeeding Aurignacian, Solutrean, Magdalenian and Neolithic cultures, implements of simple section are prevalent, and as has been mentioned above, only a very few exhibit a section which can be described as complex. The author would like it to be clearly understood that this chart has been prepared solely with a view to show how in all probability the various types of flint implements have been evolved, and that no other significance, geological, or otherwise, is at present to be placed upon it. But it seems of interest to realise that primitive implements of the Kent plateau type, which have long been recognised by many prehistorians, as representing the earliest efforts of man to shape flints to his needs, should have provided apparently the basic forms out of which all other flint implements were gradually developed. But there is a strong undercurrent of "inevitableness" running through the whole origin and development of flint implements. The people of the Kent plateau, being apparently without a knowledge of the manner in which to produce a flat striking-platform by intentional flaking, selected pieces of tabular shaped flint which afforded naturally-produced flat surfaces, upon which to deliver flake-removing blows. This fact, coupled with their wish to give cutting edges to these pieces of tabular flint, could not fail to produce the racloir and point with which we are familiar. Such production being accomplished, the point, on the one hand, developed almost inevitably into the rostro-carinate implement, and this into the normal palæolith. On the other the primitive point and racloir seemed to have developed gradually into the Mousterian implements, and, as we have seen, the vast majority of the implements of the post-Mousterian cultures, preserve the simple, primitive section allied to that of the Kentian specimens. The origin of the flake-implement has been explained, and it was shown that this type of specimen dates



NEOLITHIC implements
Axes and arrowheads of complex section
Scrapers etc of simple section
AXE
SCRAPER
MAGDALENIAN implements.
Scrapers etc of simple section.
SCRAPER
SOLUTRIAN implements
Blades of complex section
Scrapers etc of simple section
BLADE
SCRAPER
AURIGNACIAN implements
Planes and scrapers of simple section
PLANE
SCRAPER.
MOUSTERIAN implements
Racloirs points and flake implements of simple section.
A few coups de poings of complex section
RACLOIR
POINT.
FLAKE-IMPLEMENT
CHALKY BOULDER CLAY
implements of marked Mousterian form Racloirs points and flake-implements of simple section Rostro carinates very rare
RACLOIR.
POINT
FLAKE-IMPLEMENT.
MIDDLE GLACIAL GRAVEL
implements of Mousterian form Racloirs points and flake-implements of simple section
Rostro carinates getting smaller
RACLOIR.
POINT.
FLAKE-IMPLEMENT.
ACHEULEAN HAND-AXE.
ACHEULEAN implements
Pointed and ovate palaeoliths elaborately flaked and of complex section
Implements getting smaller
CHELLEAN HAND-AXE.
CHELLEAN implements
Pointed and ovate palaeoliths of complex section
Implements large and massive
PRE-CHELLEAN HAND-AXE
PRE-CHELLEAN implements.
Earliest palaeoliths of complex section.
Rostro-carinates still in use.
ROSTRO-CARINATE.
PRE RED CRAG implements First appearance of true rostro-carinates. Primitive racloirs.
points and flake-implements
Implements of simpler section.
RACLOIR.
POINT
KENT PLATEAU TYPE implements
Primitive racloirs and points of simple section
Points prophetic of succeeding rostro-carinates.
J.R.M.
1917.

FIG. 7.

back to a very remote period. There does not appear to be any cultural connection between the Acheulean and Mousterian specimens. Most of the implements of the former epoch were made out of the actual flint nodule (the flakes removed in the flaking of the nodule being probably regarded as waste), while in the latter, an elaborately flaked core or nucleus (these must have taken almost as long to make as an Acheulean implement) was produced from a nodule of flint, and a flake-implement struck from it. Thus we see two fundamentally different cultures derived from the primitive Kentian implements, and of the two, that which preserved most of the ancient and simple characteristics lasted till the end of the Stone Age, while the other and more complex growth disappeared to all intents and purposes in much earlier times.

CHAPTER V.

A ROSTRO-CARINATE FLINT IMPLEMENT.

It is now some considerable time since the attention of the archæological world was directed to the discovery of a series of flint implements of a peculiar and novel type to which Sir Ray Lankester gave the descriptive name "rostro-carinate." These particular implements, as their name implies, bear, at their anterior region, a marked resemblance to the beak of an accipitrine bird, and also to the prow of a boat, the boat being turned keel upwards. Both Sir Ray Lankester and the author have, from time to time, published papers on these specimens.* Since the first discovery of these beak-like, fashioned flints, and the spreading abroad of a knowledge of their characteristics, a number of similar specimens have been found in parts of England, other than Suffolk and Norfolk, where they were first discovered, and in fact it may be said that the fact of their occurrence is established over a very wide area. The author has seen and examined rostro-carinate flint implements from Warren Hill, Suffolk; the Thames and Lea Valleys †; Lakenheath, Suffolk ‡; Savernake, Wiltshire §; Selsey Bill, Sussex; Kent's Cavern; the North of Ireland; France and Egypt.** Dr. Peake has also described and figured rostro-carinate implements found by him in Oxfordshire.[a] It must not be

* Moir, J. Reid. "*The Flint Implements of sub-Crag Man,*" *Proc. Prehis. Soc. of East Anglia.* Vol. 1, Part 1., pp. 17-43. "*On the Further Discoveries of Flint Implements beneath the base of the Red Crag of Suffolk.*" *Proc. Prehis. Soc. of East Anglia.* Vol. II., Part 1, pp. 12-31.

Lankester, Sir E. Ray. "*On the Discovery of a Novel Type of Flint Implements——.*" *Phil. Trans., Series B.* Vol. CCII., pp. 283-336.

† Moir, J. Reid. "*On the Evolution of the Earliest Palæoliths from the Rostro-carinate Implements.*" *Journ. Roy. Anth. Inst.*, Vol. XLVI., January to June, 1916. pp. 197-220.

‡ Lankester, Sir E. Ray. "*On the Discovery of a Novel Type of Flint Implements——.*" *Phil. Trans., Series B.* Vol. CCII., pp. 283-336.

§ Moir, J. Reid. "*Nature.*" December 27th, 1917, and *Phil. Trans. B.*, Vol. 209, 1919 (in course of publication).

** Moir, J. Reid. *Some Flint Implements of Rostro-carinate Form from Egypt.* "*Man,*" Vol. XVIII., No. 1, pp. 3-6.

[a] A. E. Peake. "*A Prehistoric Site at Kimble, S. Bucks.*" *Proc. Prehis. Soc. of East Anglia.* Vol. II., part 3, pp. 437-458.

imagined, however, that all the specimens from the aforementioned places are of the same age, for it is clear that the "fashion," of making rostro-carinates, though very much in vogue in Pliocene and early Pleistocene time, was not confined solely to these periods, but occurs sporadically in later cultures. And this is in accord with what we know of the occurrence of other types of flint implements.

Though, as has been mentioned, numerous accounts of the form and characteristics of rostro-carinates have already been published, no detailed analysis has yet been made of the flaking of any of these specimens, nor a description, based upon such an analysis, given of the actual manner in which the ancient workmen manipulated their nodules of flint. Sir Ray Lankester, however, in his model monograph on the remarkable rostro-carinate implement found beneath the Norwich Crag,* has enumerated the various flake-scars, and the direction of the majority of the blows responsible for their production.

It is the object of this chapter to carry this descriptive process one step further, and to demonstrate not only the direction of the blows responsible for the flake-scars to be seen upon the rostro-carinate implement now to be described, but to show the probable order in which these blows were delivered, and the plan upon which the ancient workman proceeded. The specimen selected for description was found some years ago in the pre-Red Crag detritus bed in the upper or most easterly channel in the brickfield of Messrs. A. Bolton and Co., Ltd., Henley Road, Ipswich. It presents all the characteristics of the implements recovered from this detritus-bed, being of massive form and coloured a dark chestnut brown, such as the older series of pre-Red Crag implements usually exhibit. The flaking is all of one period, no re-working being observable upon the specimen. Some incipient cones of percussion, and small weathered out striæ are to be seen upon some of the surfaces of the specimen, while the ridges between the flake-scars show a slight amount of attrition, and this is particularly marked on the anterior, carinal edge.

* Lankester, Sir E. Ray. "*Description of the Test Specimen of the Rostro-carinate Industry found beneath the Norwich Crag.*" *Roy. Anth. Inst. Occasional Papers.* No. 4, 1914.

A description has already been given of the manner in which the rostro-carinate implements are made,* but it may be as well in view of the purport of this chapter, to again draw attention to the scheme which was outlined, and based upon an examination of a number of pre-Red Crag and other specimens.† As has already been pointed out (Chapter 3) the rounded sides of the ordinary flint nodule afford very unsatisfactory surfaces upon which to deliver flake-removing blows with precision. It becomes necessary, therefore, to provide by flaking, a more or less flat striking-platform, and this is the first thing to do in proceeding to make a rostro-carinate flint implement. A blow is delivered at the anterior end of the potato-shaped flint selected for manipulation, and a large flake detached (Fig. 1, Plate 23). The resulting flake-scar forms the striking-platform upon each side of which flake-removing blows are delivered, and by the convergence of the flake-scars of either side the keel or carina is produced (Figs. 2 and 3, Plate 23). It is sometimes necessary to remove flakes by blows upon the upper dorsal surface, in the production of the keel, and in the Norwich Test Specimen described by Sir Ray Lankester, it is clear that the original nodule of flint was fractured by two great cleaving blows, so that both a ventral and dorsal striking-platform were formed. It was originally pointed out by Sir Ray Lankester, that the makers of these implements probably selected a piece of tabular flint to work upon, and that later, where such pieces were not naturally to hand, he prepared a tabular "chunk" by two cleaving blows. The production of a dorsal striking-platform was also needful when the flint nodule was too big for comfortable prehension, a condition necessitating the modification of the posterior region of the implement by the removal of flakes. The specimen now to be described possesses such a dorsal striking-platform and has evidently been modified at its posterior region for prehension.

It is necessary when setting out to ascertain the exact manner in which a flint implement was made, to be fully acquainted with the various characteristics of the flake-scars which indicate the direction of the blows responsible for them, and the order in which these

* Moir, J. Reid. "*The Making of a Rostro-carinate Flint Implement.*" "*Nature.*" Nov. 21st, 1912, p. 334. "*On the Evolution of the Earliest Palæoliths from the Rostro-carinate Implements.*" *Journ. Roy. Anth. Inst.*, Vol. XLVI., January to June, 1916, pp. 197-220.

† A series of flints flaked by the author showing the various stages in the manufacture of a rostro-carinate flint implement is exhibited in the Museum at Ipswich.

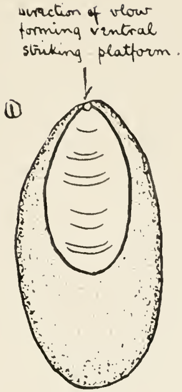
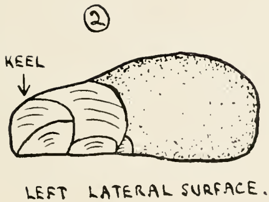


FIG. 1



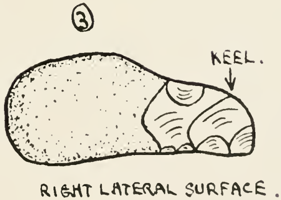


FIG. 2. FIG. 3.

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1918.

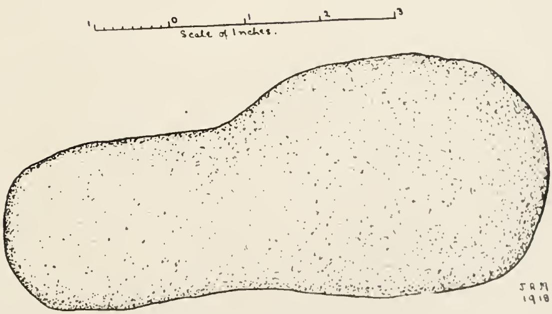

FIG. 4.

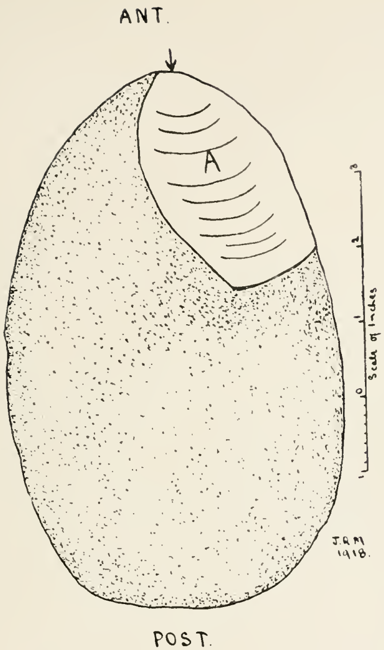

Fig. 5.

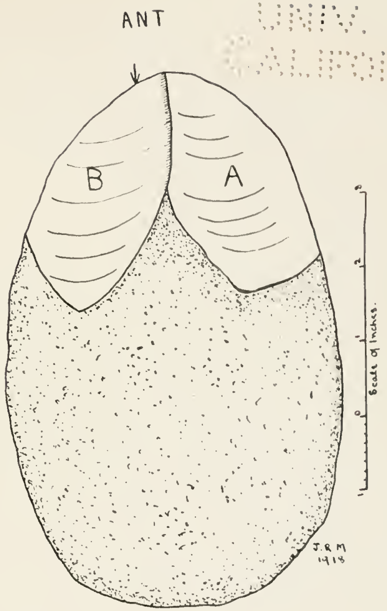

Fig. 6.

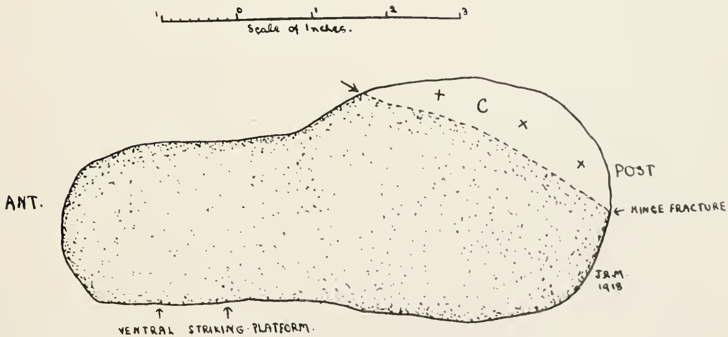

Fig. 7.

blows were delivered on the flint nodule. The characteristics which demonstrate the direction of the blows are three in number, viz. (*a*) conchoidal rippling, (*b*) fissures, and (*c*) negative cones of percussion (the positive cone is seldom seen upon the flaked surfaces of flint implements), and the author has already given details of these characteristics in Chapter I. The order in which the various flake-removing blows were delivered, can be ascertained by an examination of the truncated flake-scars observable upon the implement. For instance, if two flake-scars are contiguous and the outline of one of them is seen to be complete, while the other has been encroached upon or truncated by the complete example, it is clear that the flake-scar which is entire was caused by a blow struck after that responsible for the incomplete example. When, as is often the case, a flake-scar has become greatly truncated, and only a small portion of it remains, it is necessary to examine this remaining portion with great care, with a good lens, so that the direction of the flake-removing blow may be accurately determined. But a little experience in such matters will very soon remove any doubt or difficulty regarding such determination, and the author has confidence in stating that his conclusions regarding the specimen now to be described would not be challenged by anyone examining the implement and possessed of a knowledge of flint fracture. The drawings which accompany this chapter illustrate each stage in the manufacture of the implement. The flake-scars are numbered alphabetically A to S, and the size of the truncated examples has been carefully computed. The arrows indicate approximately the point where the blow fell and its direction.

The Shape of the Original Flint Nodule from which the Implement was Made (Fig. 4, Plate 23).

An examination of the remains of the cortex or outside crust still remaining upon various portions of the implement, makes it clear that the shape of the original nodule was almost certainly as shown. The cortex is preserved over a considerable area of the ventral surface, and extends upwards in a narrow band over the right lateral, to the middle of the dorsal surface. A similar extension of this ventral cortex is observable towards the posterior portion of the left lateral surface.* These indications, together with the downward curvature of the dorsal cortex towards the anterior region of the implement, make it possible to arrive at a very close approximation to the size and shape of the original flint nodule. The shape of the nodule is significant. It seems clear that the ancient workmen selected a mass of flint of a form suitable for making into a rostro-carinate implement. He no doubt realized, that in producing the beak-like anterior region, the narrower end of the nodule would be the best to operate upon, as such a plan of attack would not necessitate the removal of too much useless material, while, the other, bulky end of the flint would make it possible to produce the required massive handgrip with a minimum amount of trouble. The author has himself selected flint nodules for making into rostro-carinates, and found that specimens of the shape described above, are more easily made than others into the particular type of implement under description in this chapter. We thus see that the shape of the flint nodule itself from which this rostro-carinate was made, seems to afford clear evidence of its careful selection by a reasoning being well acquainted with the art of flint flaking.

The Formation of the Ventral Striking-Platform.

1st Stage (Fig. 5, Plate 24). It is evident that the maker of this implement commenced his work by detaching a large flake from the ventral surface of the flint nodule by means of a blow delivered at its anterior end (this flake-scar is marked A). As has been pointed out, this flake is removed because it is necessary to produce a flat striking-platform upon which flake-removing blows may be delivered with precision, in the formation of the keel or carina.

2nd Stage (Fig. 6, Plate 24). It appears that the ancient workman was not satisfied with the area of the flake-scar A, and so he delivered another blow (contiguous to that responsible for A) producing the flake-scar B, which, as will be noticed, slightly truncates A. As both these flake-scars A and B are cut into by the last blows delivered in the formation of the right and left surfaces of the keel, it becomes evident that the formation of the ventral striking-platform was prior to that of the keel.

* In all the text figures, the cortex is indicated by dotted areas. The foregoing description can easily be followed by an examination of the illustrations.

The Production of the Dorsal Striking-Platform (Fig. 7, Plate 24).

The production of the ventral striking-platform was followed by the formation of its dorsal equivalent. The cause of the production of this dorsal striking-platform was no doubt governed by the necessity for modifying the posterior region of the nodule for prehension. As will be noticed in Fig. 4, Plate 23, the cortex rises somewhat abruptly towards the posterior region, and it was on the more or less flat surface afforded by this "escarpment" of cortex that a blow was delivered which removed a considerable amount of the posterior region (indicated in Fig. 7, Plate 24, by crosses), and produced a well marked hinge-fracture at the point of its emergence from the parent block. And it is to be remarked that the nature of the blow responsible for the production of this dorsal striking-platform is of quite a different order from any of the others which were delivered in the making of the implement. The maker of the specimen no doubt realised that the ordinary type of blow giving rise to a flake-scar showing the usual hollow of the negative cone of percussion, and other marked conchoidal characteristics would not produce the surface he required. So he had resort to what is known as a cleaving blow, such as the Brandon flint knappers use in quartering their flint masses, which very seldom gives rise to a cone of percussion and other inequalities in the fracture-surface produced. The adoption on occasion of this method of flaking by the pre-Red Crag people has already been drawn attention to.*

The Production of the Left Lateral Surface.

1st Stage (Fig. 8, Plate 25). The formation of the dorsal and ventral striking-platforms having now been accomplished it was possible for the ancient flint flaker to proceed further with his work. It is, of course, not possible to say definitely whether he first formed the left or right lateral surface of the implement, because except at the extreme posterior end of the implement where the keel or carina is situated, the flake-scars of these two surfaces do not meet, and

* J. Reid Moir. *"On the Further Discoveries of Flint Implements beneath the base of the Red Crag of Suffolk." Proc. Prehis. Soc. of East Anglia.* Vol. II., part 1, pp. 12-31.

determination of priority by means of observing the truncation of the flake-scars impossible. But one of the two lateral surfaces must be dealt with first, and the author selects that on the left hand for description. The first stage in the production of this surface is very simple. A blow was delivered upon the ventral striking platform, and the flake-scar D produced and another blow delivered upon the dorsal striking-platform gave rise to the flake scar E.

2nd Stage (Fig. 9, Plate 25). This stage is represented by the production of the flake-scars F, G, and H. A blow delivered upon the ventral striking-platform gave rise to the flake-scar F, which truncates D, while two more delivered upon the dorsal striking-platform, resulted in the production of the flake-scars G and H, both of which encroach upon and truncate E. The flake-scar H exhibits a V-shaped hollow or "median chink" similar to that Sir Ray Lankester draws attention to in the posterior region of the Norwich Test Specimen.*

3rd Stage (Fig. 10, Plate 25). This stage is represented by the production of the flake-scar J by a blow delivered upon the ventral surface of the implement, which truncates H. It is to be noticed that in the formation of the left lateral surface the flake - scars D and F were produced in forming the keel, while E, G, H, and J may be said to owe their formation to the necessity for a comfortable and firm hand-grip of the implement.

The Production of the Right Lateral Surface.

1st Stage (Fig. 11, Plate 26). In the production of the right lateral surface, a blow was first delivered upon the dorsal striking-platform and the flake-scar K produced. Another blow delivered upon the then flattish dorsal area in the region of the keel was responsible for the formation of the somewhat "hackly" flake-scar L. The production of the latter gave rise to a small ledge or platform, and made it possible to deliver a flake-removing blow at the point marked with an arrow, and to form the flake scar M. But the exact utility of this flake-scar (unless it was produced to "balance" the implement) is somewhat difficult to understand.

* Lankester, Sir E. Ray. "*Description of the Test Specimen of the Rostro-carinate Industry found beneath the Norwich Crag.*" *Roy. Anth. Inst. Occasional Papers* No. 4, 1914.

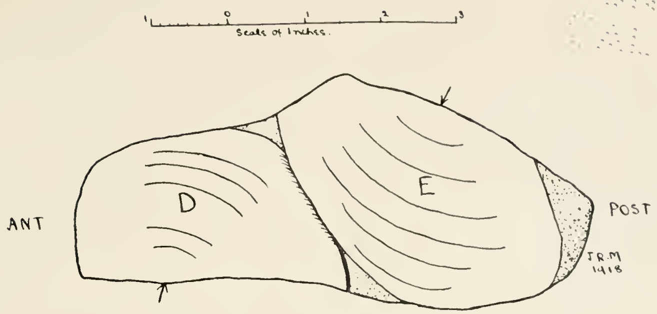

FIG. 8.

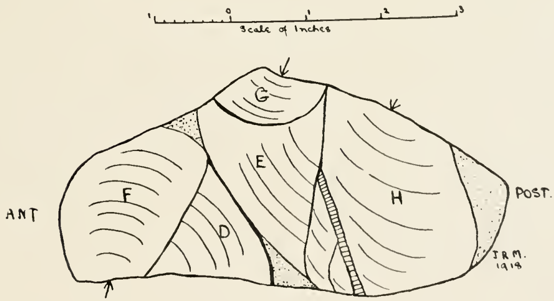

FIG. 9.

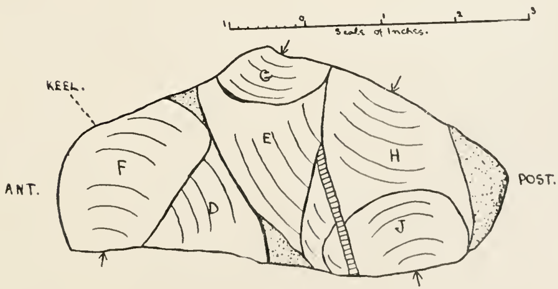

FIG. 10.

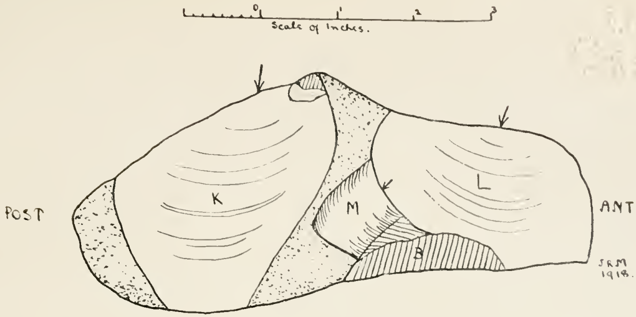

FIG. 11.

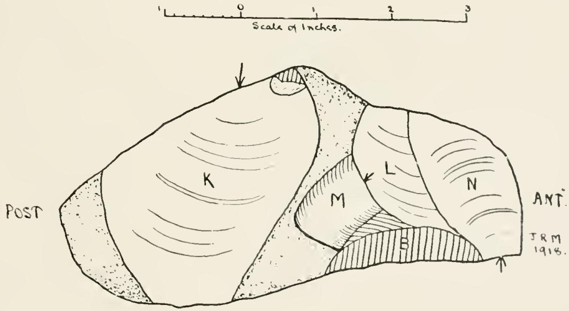

FIG. 12.

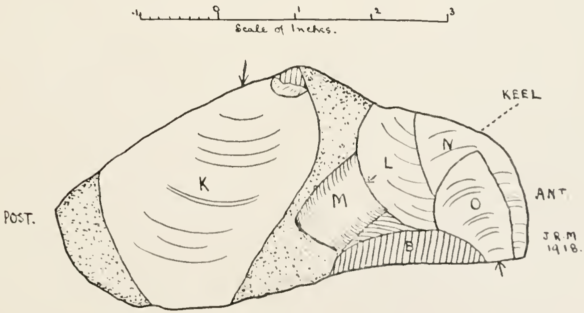

FIG. 13.

2nd Stage (Fig. 12, Plate 26). This stage is represented by the flake-scar N which truncates L, and was produced by a blow delivered upon the ventral striking-platform.

3rd Stage (Fig. 13, Plate 26). This stage is represented by the flake-scar O (the result of a blow delivered upon the ventral striking-platform) which truncates L and N.

As in the case of the left lateral surface, it is to be noted that the flake-scars L, N, and O were produced in forming the keel, while K owes its existence to the necessity for a comfortable and firm hand-grip of the implement.

The Final Trimming Up of the Dorsal Surface of the Implement.

1st Stage (Fig. 14, Plate 27). A blow was delivered upon the upper portion of the right lateral surface, and the flake-scar P produced.

2nd Stage (Fig. 15, Plate 27). A second blow was delivered in close contiguity to that responsible for P and the flake-scar R formed, which truncates P. A final blow delivered upon the upper portion of the left lateral surface gave rise to the flake-scar S which truncates C. As in the case of the flake-scar M, it is difficult to see what useful part these three flake-scars, P, R, and S, play in the formation of the implement, but their origin may perhaps be referred to a love of symmetry and "balance" on the part of the ancient flint flaker.

From the foregoing description of the manner in which this rostro-carinate flint implement was made, it is clear (1) that the ancient flint flaker followed almost precisely the same plan as that adopted by the author in making specimens of this character. (This is regarded as inevitable, as the author knows of no other way in which a rostro-carinate can be formed from a potato-shaped nodule of flint). And (2) that from the initial selection of his raw material, to the final blows when the implement was completed, we see without question a reasoning human brain directing each stage in the work. The ancient craftsman knew, as all modern flint flakers know, that flat striking-platforms are a necessity in making an implement of any kind, and we have seen that this knowledge was put to good effect. We recognise also that in the production of the dorsal striking-platform, this Pliocene individual was able to deliver what is known as a cleaving blow, being fully conscious no doubt that a flat surface would result. The whole object of the production of this and other rostro-carinates was, in the author's opinion, the formation of an implement having a heavy butt or posterior region suitable for prehension, and a sharp well-supported cutting edge at the opposite, anterior end. He does not regard the beak-like appearance of the posterior region as a functional character, but simply as an almost inevitable result of the manner in which these people fashioned the cutting edges of their flint implements. This view is supported by the result of the experiments in flint fracture, which he has conducted, and he thinks if other investigators conduct similar experiments they will find themselves in agreement with these conclusions. But whatever may be the exact significance of the curving keel or carina, it is established that the particular implement under discussion was fashioned on a definite and careful plan, and that the specimen when newly made would be very useful for cutting and hacking purposes. An examination moreover, of the keel or cutting edge, shows that it exhibits considerably more battering than the other ridges of the implement, and this intensified battering the author would ascribe to use.

A close study of the actual flake-scars of this rostro-carinate specimen shows that blows were responsible for their formation. There is no evidence that any portion of the flint has been broken by pressure or thermal effects. The characteristics of the flake-scars produced by these two last-named agents of fracture have been fully discussed in Chapter I., and there is no need to again describe them here, but it may be mentioned that flake-scars which are "resolved,"* and which exhibit hinge-fractures, fissures, conchoidal rippling, negative cones of percussion, and an "intelligent" truncation, can be regarded with some amount of certainty as having

* "Resolved Flakes." This name has been given to flakes which exhibit, at the point of their final separation from the parent block of flint, a small step or ledge ; and this peculiarity may be regarded as being due to the manner in which the flake-removing blow was struck. The normally struck flake does not resolve in the manner described, but pursues its line of fracture uninterruptedly, and exhibits at the point of its final separation from the parent block of flint, a thin, sharp edge. The presence of resolved flakes upon flints flaked by fortuitous natural means has already been noted, but these flakes are of a different order from those removed from the flint implement under description.

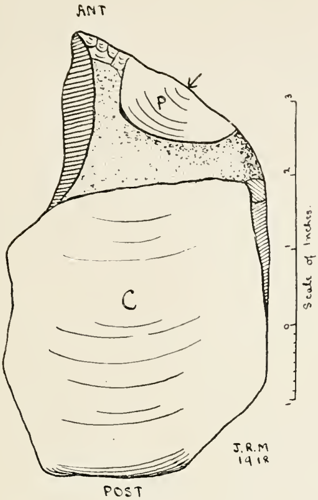

Fig. 14.

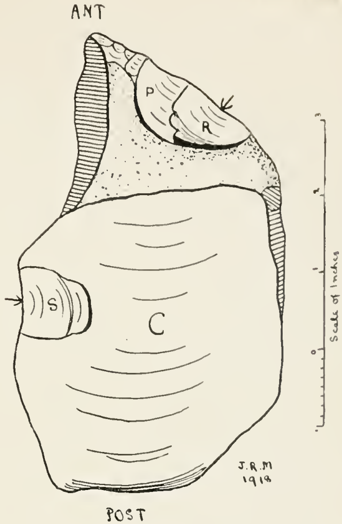

Fig. 15.

FLAKES.	RESOLVED.	HINGE FRACTURE.	FISSURES.	CONCHOIDAL RIPPLING.	NEGATIVE CONE.	TRUNCATED.
A.	+	+	+	+		+
B.	+		+	+		+
C.		+	+			+
D.	+		+	+		+
E.	+		+	+		+
F.			+	+	+	
G.	+		+	+		
H.			+	+	+	+
J.			+			
K.			+	+		+
L.	+		+	+		+
M.	+		+	+		
N.				+		+
O.			+	+	+	
P.	+		+	+	+	+
R.	+		+	+		
S.	+		+	+		
TOTALS. 17	10	2	16	15	4	10

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1918.

Fig 16.

had their origin in forceful human blows. The author has very carefully examined with a good lens the seventeen flake-scars observable upon the specimen under description, and has compiled the results in the form of a table (Fig. 16, Plate 27). A glance at this table will show that ten of the flake-scars are resolved, two show hinge-fractures, sixteen well-marked fissures, fifteen conchoidal rippling, four negative cones of percussion, and ten truncation. Thus we see that not only the selection of the original flint nodule, the manner in which it was flaked, and its obvious usefulness as a hand implement, testify to human purposes and skill, but the details of the flake-scars of the specimen provide evidence of equal cogency in favour of the same conclusion. The method adopted in this chapter of tracing every step in the production of flint implement, would seem to be the only reliable way of ascertaining what a flaked flint really means. The old plan of regarding an implement as certainly made by man, but without any real knowledge of how the manufacture was carried out, would appear to be unsatisfactory.

CHAPTER VI.

PRE-PALÆOLITHIC MAN IN ENGLAND.

It has been the purpose of the foregoing chapters to draw attention to some of the various forms of flaked flints found in deposits of a greater antiquity than those containing the normal palæolithic implements, and to describe the experiments in flint fracture which were carried out, and which have convinced the author that these flaked flints are undoubted works of men. He has endeavoured to establish the fact that in this country we have evidence of a continuous evolution in the making of flint implements, which, commencing with the most primitive "eolithic" edge-trimmed stones, proceeded uninterruptedly and inevitably to the production of the well-known pointed and ovate palæolithic artefacts.

He is perfectly well aware that such a view runs counter to the opinions held by the more conservative school of archæologists both at home and abroad, which, while not denying that the earliest palæolithic implements cannot represent the first efforts of man in flint flaking, has nevertheless been unable to believe that the races of pre-palæolithic people are represented, either by their flint implements or actual skeletal remains in this part of the country.*

It has been the custom with some to look to Asia as the birthplace of mankind, an area, as Keith so truly states in a recent issue of *Man* (Vol. XVII., May, 1917), "of which we know almost nothing, and therefore can believe it capable of anything." The author has read with care the arguments put forward by various writers in support of this and similar hypotheses, and has found them to be unsatisfying and unsatisfactory. He is unacquainted with a single

* See, for instance, "*Men of the Old Stone Age.*" *Their Environment, Life, and Art.* Henry Fairfield Osborn, 1916. "*Man the Primæval Savage,*" G. Worthington Smith, p. 2.

valid reason for accepting the view that Asia witnessed the earliest stages of man's evolution, and, moreover, as this vast country is a veritable *terra incognita* to prehistorians, it would seem somewhat useless to engage in speculation as to what did or did not happen there in the remote past. But, as he knows of no satisfactory reasons why Asia should be regarded as the probable home of earliest man, neither is he familiar with any cause or causes which would preclude the area which is now England from having had that distinction. Thus from the standpoint of pure theory anyone may favour Asia or England as their fancy prompts them.

When, however, we pass from the domain of theory to that of fact the situation assumes a different aspect. Of pre-historic Asia we know next to nothing and therefore have no facts to rely upon; of pre-historic England on the other hand we know a great deal, and have a multitude of facts at our disposal. What are those facts? First and foremost there are the various pre-Chellean flint implements which have been found in different parts of the country.

The author has seen and examined such implements from the Kent plateau,* from ancient deposits near Salisbury, Peppard in Oxfordshire, Aldershot, and Selsey Bill, in Sussex.† It would thus appear that these early flint implements occur over a very wide area, and further search will no doubt extend it still more. But it is in East Anglia where the greatest facilities exist for recovering evidences of pre-Chellean man. In this district occurs a widespread deposit of Pliocene Red Crag surmounting a detritus-bed containing the débris of an ancient pre-Crag land surface.

In no other part of England is such a deposit as the Red Crag to be found and in fact the Pliocene strata are almost solely confined to East Anglia.

It has been the author's good fortune during the past twelve years to have been able to investigate the sub-Red Crag detritus-bed in search of flint implements. This deposit is exposed in various pits sunk into the plateau in the neighbourhood of Ipswich, and it is in this plateau that the present rivers have cut their valleys.

* "*On the Primitive Characters of the Flint Implements of the Chalk Plateau of Kent.*" Prestwich, Sir J. *Journal Anthrop. Inst.*, Vol. XXI., pp. 246-262.

† "*The Sub-Crag Flints,*" J. Reid Moir. *Geol. Mag.* V., Vol. X., No. 12, Dec., 1913, pp. 553-555.

A glance at Fig. 1, Plate 28, will at once show the reader the relation of the plateau beds to the valley deposits and demonstrate that the former are of a much greater antiquity than the latter. In Fig. 2, Plate 29, is shown a diagrammatic vertical section of these plateau beds, and we will proceed to an examination of the lowermost and oldest stratum, the sub-Red Crag detritus-bed which rests upon the London Clay. The top of the London Clay was a land surface in pre-Crag times, and this land surface was eventually slowly submerged beneath the waters of the Crag sea. The objects lying upon this ancient land surface, large and small flints, flint implements, wood, mammalian teeth, pieces of bone, etc., were no doubt swept during this submergence into hollows or pockets in the London Clay, and finally covered by the sands and shells of the Red Crag sea. The implements recovered from the detritus-bed are fashioned by bold and skilful flaking and include the well known rostro-carinate form together with scrapers, borers, choppers, etc.* Though these specimens occur sealed down beneath a definite Pliocene deposit it is evident that they cannot represent man's first efforts in flint flaking and the earliest examples of his handiwork must in consequence be looked for in still more ancient strata.

The detritus-bed is generally about six to twelve inches in thickness, and the Crag surmounting it may be twenty or more feet in depth. But it seems probable that during the succeeding glacial period a large amount of the Crag was eroded away, and originally, therefore, there was a much greater thickness than is now present.

This brief account of the pre-palæolithic implements of East Anglia and elsewhere will serve to demonstrate that in England we have very clear evidence of the presence of races of people making implements of a primitive type who apparently lived prior to the time when the earliest palæolithic implements were fashioned.

* "*The Flint Implements of Sub-Crag Man,*" J. Reid Moir. *Proc. Prehis. Soc. of East Anglia.* Vol. I., part 1, pp. 17-43.

"*On the Discovery of a Novel Type of Flint Implements——.*" Sir Ray Lankester. *Phil. Trans., Series B.*, Vol. 202, pp. 283-336.

"*On the Further Discoveries of Flint Implements beneath the base of the Red Crag of Suffolk.*" J. Reid Moir. *Prehis. Soc. of East Anglia.* Vol. II., part 1, pp. 12-31.

"*Implemets of Sub-Crag Man in Norfolk.*" W. G. Clarke. *Proc. Prehis. Soc. of East Anglia.* Vol. I., part 2, pp. 160-168.

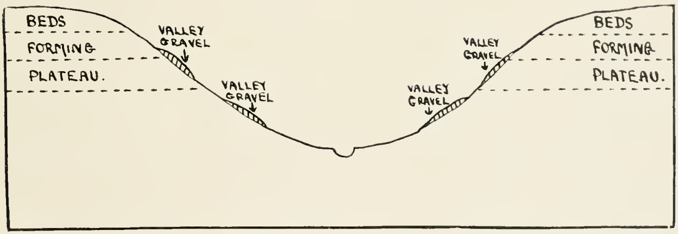

FIG. 1

Sectional drawing showing the relationship of the plateau beds to the valley gravels laid down by the river when eroding its bed through the plateau.

That appears to be a fact of the first importance, far exceeding in scientific value speculations regarding ancient, unknown Asia.

The second fact which appears to lend support to the view that the flint implements and actual skeletal remains of pre-palæolithic man are represented in this country, is afforded by the now famous discovery at Piltdown in Sussex. The author confesses that he is somewhat loth to add fuel to the fires of controversey which, since their discovery, have raged round these ancient human remains. But in his judgment these relics have been misinterpreted both as regards their age and significance, and it seems to be necessary to comment upon them.

As is well known, the late Mr. Charles Dawson, of Lewes, found at the base of a thin deposit of gravel at Piltdown, portions of a very thick and massive human skull, associated with half of a remarkable human lower jaw.* This jaw-bone and a very large canine tooth found near it show in many respects distinct simian characteristics, while the skull, whatever its exact form and size may be, appears to be human in its characteristics.

Thus we find in this unique fossil a combination of human and simian characters, such as have been looked for by evolutionists ever since Darwin first enunciated his famous theory regarding the ancestry of modern man. But all evolutionists would probably agree that such a form would occur only at a very early stage of man's development, and this is a fact of great importance. Putting aside for the moment all considerations of the geological age of the Piltdown remains, and the type of flint implements found with them, we may say with some confidence that the whole aspect of the bones, their condition of fossilisation, and their half-human, half-simian character, point to a very great antiquity. How does the geological evidence affect such a conclusion?

The human bones were found in the lowermost stratum of a thin deposit of gravel resting at about 120 O.D. and approximately 80 feet above the level of the Sussex Ouse. The height at which any particular deposit occurs above sea or river-level is in itself

* "*On the Discovery of a Palæolithic Skull and Mandible——.*" Chas. Dawson and Arthur Smith Woodward. *Q.J.G.S.*, March, 1913, Vol. LXIX.

of little value. Ancient beds may outcrop at a very low level, while much newer strata may occur at a considerable height above sea or river level. The author mentions this merely to demonstrate that the antiquity of the Piltdown gravel cannot be determined by reference merely to the height at which it occurs.

It is necessary, therefore, to examine the actual strata composing the gravel-bed. Mr. Dawson, in his very accurate and careful examination of this deposit, recognised four well-defined strata,* and it was in the lowermost but one of these, resting upon "a pale-yellow finely divided clay and sand," that the human remains were found. With these remains were found fragments of the bones and teeth of six different animals, two, and most likely three, of which can be referred with certainty to the Pliocene period. The three other mammals, Red Deer, Horse, and Beaver, may or may not be of Pliocene date.

Of the beaver Dr. Smith Woodward states† that it is "most probably Pleistocene," while of the Red Deer he remarks that typical specimens "have never hitherto been found below the Pleistocene." The discoverers of these various relics at Piltdown draw attention to, and seem to lay stress on, the fact of the difference in condition of the specimens as regards the amount of rolling by water to which they have been subjected, and apparently attempt to draw some of their conclusions regarding the respective ages of the relics from such differences. While it is of course possible that these conclusions are sound, the author's experience, however, has led him to place little value on the condition of any constituents of a deposit of gravel, and he has sometimes found specimens of contemporaneous date and lying in close proximity to each other, some of which are rolled while others exhibit scarcely any signs of their transport. And if one attempts to envisage the multifarious varieties of treatment to which specimens in a gravel would be subjected during its deposition, such apparent paradoxes are not very difficult to understand.

* "*Supplementary Note on the Discovery of a Palæolithic Skull and Mandible . . .*" *Q.J.G.S.* April, 1914, Vol. LXX., p. 83.

† "*On the Discovery of a Palæolithic Skull and Mandible . . .*" *Q.J.G.S.* March, 1913. Vol. LXIX., p. 148.

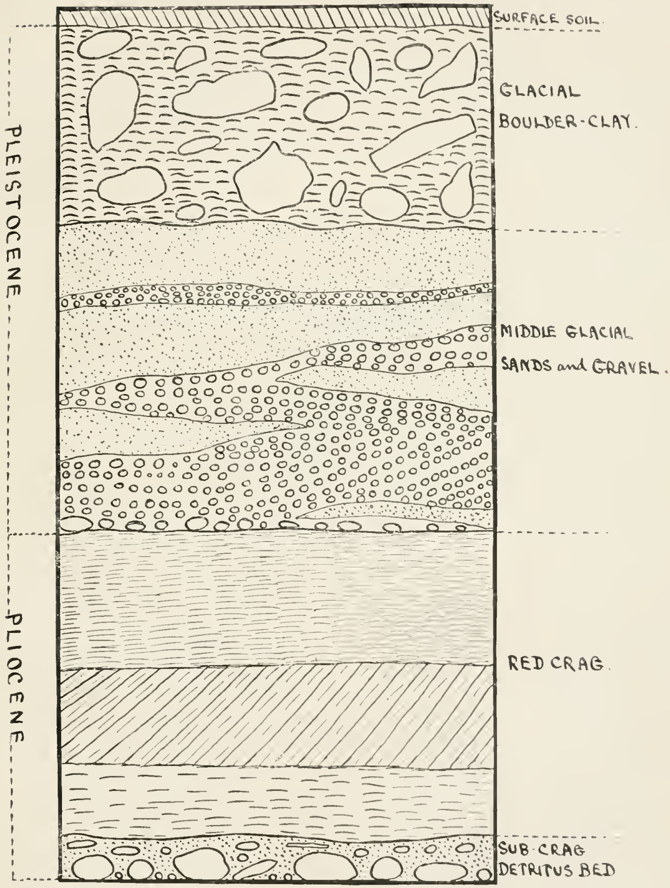

FIG. 2.

Vertical section showing the principal beds forming the upper portion of the plateau near Ipswich.

There would not appear to be any valid geological reason why the lower stratum of the gravel at Piltdown should not be a Pliocene deposit overlain by gravelly strata of later date, and the author knows that such an association of beds of different ages occurs not infrequently in the valleys of East Anglia.

In a *Supplementary Note* on the discovery of the Piltdown Skull* Messrs. Dawson and Smith Woodward state " We cannot resist the conclusion that the third or dark bed is, in the main, composed of Pliocene drift, probably reconstructed in the Pleistocene epoch," and if, as seems possible, such reconstruction is problematical, it is clear that the geological evidence does not conflict seriously with the view based upon the characters of the human bones themselves, that these bones must be of a very considerable antiquity. But it is when we turn to the evidence afforded by the flint implements found with the Piltdown person, that this great antiquity seems definitely established. If the author, as a practical flaker of flint, had been shown Dr. Smith Woodward's reconstruction of the Piltdown skull and jaw, and had been asked what sort of flint implements in his opinion such a very primitive semi-human creature would be capable of producing, his answer would have been " the very primitive edge-trimmed flints generally known as eoliths."

He would not regard it as probable that such an ape-like man would be able to make even the earliest of the pointed or ovate palæolithic implements, which he knows from experience require much thought and skill to produce. Now if we turn to the excellent illustrations of the flint implements found *in situ* at Piltdown.† it will be realised that such a supposition is correct, as there does not appear to be a single example of a pointed or ovate palæolith among these illustrations. There are certainly some flints illustrated of which the legend reads, " Palæoliths from Piltdown," but it seems impossible to accept the correctness of this description. Some little time ago Dr. Smith Woodward very kindly gave the author an opportunity of examining these specimens and he at once recognised , as is also clear in the drawings, that the workmanship of the flints is quite distinct from the technique of the makers of the normal palæolithic implements. The ill-defined cones of percussion, and rough, heavily-truncated flake-scars of the Piltdown specimens stamp them indelibly as the work of pre-palæolithic man.

* *Q.J.G.S.* April, 1914. Vol. LXX., p. 85.
† *Q.J.G.S.*, March, 1913. Vol. LXIX. Plates XVI. and XVII.

Similar specimens to these have been found below the Pliocene Red Crag, and the reader is referred to Fig. 10, Pl. 12, Chapter 3, which testifies to the truth of this statement. But when it is realised that these particular flint implements, which, as has been shown, pre-Crag man was capable of making, are the *latest* found in the Piltdown Gravel, and that they occurred in a stratum apparently less ancient than that containing the human bones, it will be seen that we are dealing with the remains of a person who in all probability existed at a period, the remoteness of which is much greater than that of the palæolithic epoch. For the only implements found in the "human" stratum and in intimate association with the Piltdown individual were the primitive edge-trimmed flints generally described as eoliths.* This particular type of implement represents, as has been shown in a former chapter, the earliest efforts of man to deliberately shape flints to his needs. It has also been shewn in the same chapter that there is very good reason to believe that these "eolithic" implements were the precursors of the rostro-carinate form found in the sub-Crag detritus-bed. Thus it would appear probable that the human remains from the Piltdown gravel must be relegated to the early pre-palæolithic period.

There would appear to be no easy escape from these conclusions, if the antiquity of the Piltdown remains is computed in the same way as the age of all other ancient human bones. In the case of the Neanderthal and other Pleistocene skeletons which have been found, their antiquity has been decided upon by reference to the geological strata in which they lay, and the fauna and flint implements with which they were associated.

If this method, the only satisfactory method, is applied in the case of Piltdown, the evidence is very strongly in favour of an early pre-palæolithic date for the human bones found there.

It is thus the author's opinion that we have definite and clear evidence that the pre-palæolithic peoples are abundantly represented in this part of the world. This conclusion is based on the following facts:

(1). The discovery in various parts of England of different kinds of flint implements in deposits which are of a greater antiquity than those containing the earliest palæoliths.

* *Q.J.G.S.*, April 1914. Vol. LXX., pp. 84 and 85, also Plate XIV.

(2). The discovery at Piltdown in Sussex of the remains of a very primitive type of human being in intimate association with certain definite Pliocene and other ancient mammalian forms, and the earliest kind of flint implements known to science.

The neolithic and palæolithic stages in this country are fairly well known, but the vast pre-palæolithic periods await examination.

These periods are fully represented in England and the flint implements, etc., contained in the deposits laid down during these epochs must be collected and investigated. Such an investigation will almost certainly show that the evidences of man's pre-palæolithic history are as abundantly represented here as in any other part of the world, and it is to be hoped that in the interests of science in general, and pre-historic archæology in particular, it may be speedily commenced.